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► **To cite this version:**

Michael Nartey Agbeko, John Effah, Richard Boateng. Electronic Procurement Practices in the Public Sector: The Case of an Inter-organizational Information System in Ghana. 20th Conference on e-Business, e-Services and e-Society (I3E), Sep 2021, Galway, Ireland. pp.60-70, 10.1007/978-3-030-85447-8_6 . hal-03648133

HAL Id: hal-03648133

<https://inria.hal.science/hal-03648133>

Submitted on 21 Apr 2022

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Electronic Procurement Practices in the Public Sector: The Case of an Inter-organizational Information System in Ghana

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Abstract. The importance of inter-organizational information systems (IOISs) to contemporary organizations has been demonstrated in research and practice. However, the effects of IOISs use on procurement practices in the public sector are less understood. The practice lens theory is drawn upon in this study to understand IOIS effects on procurement activities in the public sector of Ghana, a developing country context. The findings show the effects as: (1) successful online tendering processes; (2) unsuccessful online procurement execution processes; and (3) continuing use of paper-based document exchanges. The paper discusses how the effects resulted in a partial online procurement system and the failure to realize the desired benefits. It also discusses the constraints of a full-scale e-procurement platform deployment and use in developing country public sector and how they can be addressed.

Keywords: Inter-organizational Information Systems, Public Sector, E-Procurement, Practice Lens Theory, Interpretive Case Study, Ghana

1 Introduction

The purpose of this study is to understand the effects of inter-organizational information systems (IOISs) use in public sector procurement practices. IOISs are ICT infrastructure that enables interactions between actors in different organizations [1]. Governments around the world pursue e-government initiatives to digitalize operations and improve effectiveness and efficiency [2]. One of such initiatives is electronic procurement (e-procurement) [3].

Within the public sector, e-procurement refers to the use of integrated web-based IOISs for government purchasing processes [4, 5]. E-procurement enables government institutions to conduct online public tenders and reach out to potential bidders [6]. In the public sector, e-procurement is noted to be one of the means to reduce corruption [6, 7].

Information systems (IS) research on IOISs in the public sector has focused on knowledge sharing and data synchronization [8, 9]. However, studies aiming at the

effects of IOISs on procurement practices in the public sector are limited. Thus, this study is a novel attempt to extend the literature on IOISs to the area of e-procurement in the public sector. The research question we address is how does the use of IOISs influence procurement practices in the public sector?

Accordingly, we employ the practice lens theory [10] as analytical lens and qualitative interpretive case study [11] as the methodology to gain rich insight into the use of an IOIS for procurement activities in the public sector of Ghana, a developing country in Africa. Ghana was chosen because it has recently migrated its public sector procurement activities from offline to IOISs to improve operational processes and service delivery.

The rest of the paper is structured as follows. Section 2 reviews literature on IOISs and public sector e-procurement. Section 3 presents the practice lens as the theoretical foundation. Section 4 presents the methodology. Section 5 reports the empirical findings. Section 6 provides a practice lens analysis of the empirical findings. Section 7 discusses the research findings while Section 8 concludes the paper with its contribution.

2 Inter-organizational Information Systems and Public Sector E-Procurement

IOISs are central to business ecosystems and for communication between suppliers and buyers of goods and services [12]. The advantages that IOISs offer have motivated existing firms to move towards web-based business models [13]. Thus, actors in business ecosystems use IOISs to enable exchange of information on goods and services. A crucial characteristic of IOISs is the provision of digital affordances [12]. Digital affordance denotes what an individual or organization with a particular purpose can do with a technology [12, 13]. IOISs thus provide digital affordances to consumers and suppliers by offering them the technological infrastructure for easy communication [14].

In practice, some e-procurement systems provide information only (e-announcement), while others facilitate transactions [5]. The benefits of an e-procurement platform to adopting organizations include efficient procurement processes, cost reduction, improved internal services, and improved purchasing functions [6]. Specifically in the public sector, e-procurement systems offer additional benefits such as enhanced transparency, reduced corruption, and access to foreign and SME bidders [4].

In general, e-procurement practice in the public sector is more complicated than in the private sector [4]. It adheres to rigid regulations, depends on political decisions, and involves a variety of goods or services [15]. Transparency is one of the basic requirements in public sector e-procurement, and it usually involves a variety of stakeholders with different and often conflicting agendas [15]. Consequently, institutionalizing and using such systems become very challenging and more complex [15, 3].

Despite the insights from existing studies on IOISs and e-procurement, they fail to unearth knowledge on the relationship between IOIS use and procurement activities in the public sector. Thus, it is important to understand how procurement practices are influenced by IOISs use in the public sector.

3 Theoretical Foundation

The guiding lens for this study is the practice lens theory [10]. This study employs the practice lens theory to understand the effects of IOIS on procurement practices in the public sector. The basic concepts of the theory are facilities, norms, interpretive schemes, technology-in-practice, and ongoing situated use of technology.

Facilities refer to resources needed to accomplish work, *norms* are rules that define the organizationally sanctioned way of executing work and *interpretive schemes* signify reflected knowledge of the work done [16]. *Technology-in-practice* denotes the specific interaction with technology repeatedly enacted in everyday situated activities [17]. *Ongoing situated use of technology* portrays a revised version of the technology-in-practice through repeated use as experienced differently by users at different times and circumstances [10].

The fundamental principle of the theory is enactment. Enactment is the reconstitution of technology-in-practice [17, 10]. Constant enactment of a technology-in-practice tends to reinforce it, so that it becomes standardized and repeated [10]. Enactment may occur in one of two forms: *reinforcement*, where actors enact essentially the same structures with no noticeable changes; or *transformation*, where actors enact changed structures with the changes ranging from incremental to substantial [10, 18].

The practice lens theory has been employed severally in IS research in recent years (e.g., use of technology in work places [19, 20], smart systems services [21], strategizing ICT practices [22]). However, the application of the theory in e-procurement studies IOISs studies is less hence its use in this study. The rationale for using it is that the principle and concepts are useful to understand the effects of IOISs use on online procurement services in the public sector.

4 Research Setting and Methodology

As part of a larger research project, this study was conducted as an interpretive qualitative case study [11] in Ghana. The study focuses on the effects of the use of an IOIS initiative aimed at transforming public sector procurement practices from physical to digital processes. The Ghana Electronic Procurement Systems (GHANEPS) is the IOIS and the Public Procurement Authority (PPA) is the government institution in charge of its implementation and use. GHANEPS interconnect the information systems of PPA, the Registrar General's Department (RGD), the Social Security and National Insurance Trust (SSNIT), the Ghana Revenue Authority (GRA) and the Ghana Integrated Financial Management Information System (GIFMIS).

4.1 Methodology

Interpretive case study was employed to understand how the use of IOISs shapes procurement practices in the public sector. Interpretive case study was used because it falls in line with the view that reality and the knowledge are socially constructed between researchers and respondents. The motivation for choosing qualitative interpretive case study approach is based on the understanding that the research phenomenon and its context can be understood through the meanings that participants assign to them.

4.2 Data Collection

We collected data from multiple sources, including interviews, observations, documents, and media news perusal. This approach is in conformity with interpretive research where many data sources can be used by a researcher. Interviews were conducted between 1st August, 2020 and 31st January, 2021. We used purposive sampling and snowballing to identify the various stakeholder-groups and interviewees. In all, 21 respondents were interviewed at their own convenience with sessions recorded upon gaining consent. Interviews were semi-structured [23, 24], lasted between 30 and 45 minutes, and transcribed. Table 1 shows the user-groups, interviewees, and number of interviews carried out.

Table 1. Stakeholder Groups, Interviewees and No. of Interviews

Stakeholder Groups	Interviewees	No. Of Interviews
Central Government	Senior Government Official	1
	Deputy CEO	1
Regulator (PPA)	Head of MIS	2
	IT Officer	2
	Head of Agency	2
Public Agencies	Head of Procurement Unit	2
	Tender Coordinator	3
	Tender Evaluation Member	2
	Head of Organization	2
Supplier Organizations	Head of Procurement Department	2
	Staff of Procurement Department	2
Total		21

4.3 Data Analysis

We conducted data analysis by reading and re-reading all the data gathered from the interview transcripts, documents and field notes to derive logical meanings. In doing so, we sought to gain broad understanding of how the data gathered made sense to-

wards the research question and the research purpose. Then, we iteratively compared the data with emerging findings for verification and confirmation. Where necessary, we followed up with interviewees to verify the emerging findings according to the principles of the hermeneutic circle [25].

5 Empirical Findings

Public procurement plays a significant role in national development. In view of this, the Government of Ghana passed the Public Procurement Act (Act 663) in 2003 to regulate procurement activities at all levels of government. Before 2019, procurement practices were carried out through physical interactions. However, from 2019, a digital transformation of these practices was initiated through the implementation of GHANEPS. The sections below describe procurement practices before GHANEPS and its use.

5.1 Procurement Practices before GHANEPS

Procurement activities before GHANEPS involved invitation to tender, submission of tender, tender evaluation, and award of contract. At the time, a public agency would invite tenders by publishing in the procurement bulletin and/or at least two national newspapers. In the case of international competitive tendering, the invitation was published in an international newspaper, a technical or professional journal, or relevant trade publication. The public agency physically provided tender documents to potential suppliers in accordance with the procedures and requirements specified in the procurement Act.

Potential suppliers were allowed four weeks for national competitive tendering or at least six weeks in the case of international competitive tendering for submission of tenders. Tenders were formulated in English and physically submitted at a place and time fixed by the public agency. Public agencies could extend the deadline for submission of tenders before its expiration. Notice of the extension was communicated by fax, e-mail or any other expedited written means of communication to suppliers to whom tender documents had been given.

Tenders were physically opened and evaluated when the time specified in their documents as deadline for the submission or extension is due. A supplier who had submitted a tender or their representative was permitted to be physically present at the opening. During the examination of tenders, a supplier could be asked for clarification of its tender in order to assist in the examination, evaluation, and comparison of tenders.

Award of contract involved acceptance of the tender by the public agency and the signing of a procurement agreement with a successful supplier. A contract came into force on the commencement date indicated therein. A public agency could select the next successful tender if a supplier whose tender had been accepted failed to execute the tender within 30 days, unless otherwise stated. A head of a public agency during one of the interviews noted that:

“Before a contract is signed, a public agency must ensure that the service provider meets all statutory requirements. The challenge here is that the verification of statutory requirement is cumbersome. This is due to the lack of interconnectivity between the information systems of statutory bodies in the country.”

5.2 Use of GHANEPS

GHANEPS is a web-based, collaborative IOIS that offers a secure and dynamic environment for carrying out procurement of all categories, complexity or value. It is expected to be used by all public agencies and the general population. GHANEPS was designed to support online procurement practices and procedures such as tender invitation, preparation, submission, and evaluation. It also supports advanced procurement procedures such as contract awarding, catalogue creation and management, framework agreements, auctions and payments, and asset disposal.

Public agencies are required to register on GHANEPS before they can invite and issue tenders. The head of the procurement unit (HPU) of a public agency initiates the invitation process on GHANEPS by creating a workspace per tender. The HPU then uploads a procurement plan onto the workspace and associates other users with the tender. The users associated with tenders are procurement officers (POs), tender opening panel (TOP) members, and tender evaluation panel (TEP) members of which one is the chairperson (TEPC). The associated PO uploads all documents for the tender, after which the HPU defines the workflow and evaluation criteria for the tender. The HPU then creates and publishes tender notices on GHANEPS and/or send them via emails to registered suppliers.

A supplier needs to register with PPA to bid for and submit tenders. Apart from the information systems of the RGD, SSNIT, and GRA, GHANEPS was supposed to interconnect with the Payment and SMS Gateways for effective delivery of services. The interconnections of these systems are needed for the necessary background checks on the supplier to be done. While the information system of the RGD enables PPA to verify if a supplier has been registered and incorporated as a business entity in Ghana, that of SSNIT helps to check if the supplier pays employee contributions. The information system of GRA helps to check whether a supplier has paid all relevant taxes and that of Payment Gateway is to enable the payment of procurement processing charges to PPA and public agencies to pay suppliers for executed contract.

If a supplier is interested in a particular tender, its associated documents are downloaded. After downloading the documents, the supplier then creates and submits a bid for the tender on GHANEPS. During an interview, an IT officer at PPA noted that:

“Apart from the SMS gateway which GHANEPS has successfully connected to for the sending of emails, it is unable to connect to the information systems of other public institutions and service providers which it is required to link up with. This is because the owners of the systems such as SSNIT, Registrar General and Ghana Revenue Authority are unwilling to connect them to GHANEPS due to security reasons. This means that some tendering processes involving third party organizations are still done manually”

Tender evaluation is digitally performed on GHANEPS by the TEP. Members of the TEP with conflicts of interest are not allowed to evaluate tenders. Evaluation of a submitted bid is performed when TEP members unlock bided documents and assess them. TEP members unlock bids by clicking on the unlock-bid button on the evaluation page of GHANEPS. Documents on the unlocked bids then appears on the assessment page of GHANEPS. A TEP member then assesses the unlocked bid by reading through the documents and inputting the result and other observations on the assessment page. Evaluation is finalized when the TEPC using GHANEPS generate a report that consists of summed up results of each TEP member on each submitted bid in ascending order. The evaluation report is then approved by the TEP and head of the public agency (HPO) on GHANEPS.

After the approval of the tender evaluation report, the PO announces the results on GHANEPS, by SMS, and email to bidders. The HPO then awards a contract to the bidder with the highest evaluation result by uploading contract documents on GHANEPS. The bidder who wins the contract receives SMS message from GHANEPS about the uploaded contract documents, digitally signs it, and uploads it back on GHANEPS. Lack of necessary ICT gadgets, high cost of internet data, slow and unstable internet connectivity, high ICT illiteracy rate among service providers are some challenges that users complain about when using GHANEPS.

6 Analysis

The empirical findings raise a number of interesting issues for analysis and discussion. However, in line with the research question and the practice lens theory, this section focuses on the technology-in-practice and ongoing situated use before and after the IOIS for procurement.

6.1 Technology-in-Practice and Ongoing Situated Use before E-Procurement IOIS

The empirical findings suggest the existence of some form of technology-in-practice before the e-procurement IOIS. The pre e-procurement technology-in-practice included: paper based forms; physical tender documents, procurement plans and related records; physical signature; telephone communication and emails, and the procurement act (Act 603). The use of these technology-in-practice elements before the adoption of GHANEPS constrained effective delivery of procurement services in the public sector. This led to challenges such as frustration on the part of the organizations that access procurement services, bureaucracy and unprofessional attitude of procurement officers in public agencies, delay in document processing, and corruption. The findings also suggest that invitation of tenders, submission of tenders, tender evaluation, and contract awarding were the main procurement activities to be routinely carried out i.e. ongoing situated use before GHANEPS and these activities were physically performed.

6.2 Technology-in-Practice and Ongoing Situated Use after E-Procurement IOIS

GHANEPS is the main facility needed to ensure effective offering of procurement services in the public sector. It was designed to migrate all procurement activities online, thus removing the use of physical paper and signature, as well as reducing physical contact between stakeholders. Attestation, tender notification, tender submission, contract awarding, cataloging, auctioning, and project management are the practices (i.e. norms) routinely performed through the IOIS. GHANEPS connects third-party information systems such as RGD, SSNIT, GRA, Payment Gateway, and SMS Gateway for these activities to be successfully carried out. These third-party systems, GHANEPS, and the norms were to ensure the following interpretive schemes (i.e. benefits): improve public procurement integrity; reduce corruption and procurement malpractices; enhance regulator and public entities decision making capabilities; increase compliance to procurement laws and regulations; and shortened procurement processes and cycles.

These interpretive schemes are however constrained by lack of necessary ICT gadgets, high cost of internet data, slow and unstable internet connectivity, and high ICT illiteracy rate among staff of supplier organizations. This has made GHANEPS a partial online system offering basic electronic procurement practices such as tender invitation, submission, evaluation, contract awarding, as well as SMS messaging. However, advance procurement practices such as project management, attestation, management of framework agreements, auctions and payments, and asset disposal are still offered offline.

7 Discussion

GHANEPS was intended to enable the offering of all public sector procurement practices online. The empirical findings however show that this agenda was not entirely achieved. This is because GHANEPS could not interconnect with some third-party systems needed to efficiently carry out procurement activities online. This is due to the unwillingness of the management of some of the institutions to allow interconnection between GHANEPS and their information systems because of security reasons. Effective collaboration between information systems of different organizations has been found to be one of the main benefits of IOISs [4, 9]. Nevertheless, such interconnectivities are usually associated with high security risks due to interactions between customer devices, organizations' back-end infrastructure and other third-party information systems [9]. The lack of interconnectivity between GHANEPS and related third-party systems in the public sector leads to the offering of basic electronic procurement practices such as tender invitation, submission, evaluation, contract awarding as well as SMS messaging. Advanced electronic procurement practices such as attestation, cataloging, and project management are not carried out on GHANEPS.

Other factors also shape the non-effective use of GHANEPS. These factors include: lack of necessary ICT gadgets; high cost of internet data; slow and unstable internet connectivity; and high illiteracy rate among suppliers. Public agencies and

suppliers need computers to connect and use the functionalities on GHANEPS. However, due to the lack of these devices, users from these agencies and supplier organizations are unable to connect, access, and use the platform satisfactorily.

Additionally, the high cost of internet data and the slow and unstable internet connectivity discourage stakeholders from the using GHANEPS. Third-party systems need to be always available and connected to GHANEPS for effective use. However, it is sometimes difficult to access the interconnected third-party systems through GHANEPS, even in Accra, the capital city due to unstable internet. Also, the internet is not available in most of rural Ghana, thus making it difficult for users in the remote parts of the country to access and use GHANEPS and its third-party systems. Challenges with internet connectivity are identified as one of the constraints of IOIS adoption [26, 27].

Moreover, Ghana has a large segment of her population being illiterate, particularly in ICT. Employees of small scale setups and suppliers are largely ICT illiterates. Thus, they are mostly unable to use ICT devices. Those who can use ICT devices sometimes find it difficult to understand some of the functionalities on GHANEPS. This discourages them to connect and use GHANEPS and its third-party systems. Thus, lack of IT expertise and infrastructure, technology competence, technology integration, technology readiness, unresolved technical issues, and web functionalities misunderstandings are key technological factors identified by prior research as inhibiting the effective use of IOISs [28, 29].

Finally, this study suggests that neither reinforcement nor transformation, outcomes of the enactment has been achieved as a result of the ongoing situated use of GHANEPS. Thus, enactment of technology in practice has not been realized in the case of GHANEPS making it a partial online IOIS.

8 Conclusion

The purpose of this study was to understand how the use of e-procurement IOIS influences procurement practices in the public sector. By applying the practice lens theory to analyze IOIS use in e-procurement practices, our work, in a novel way, contributes to IOIS research in the public sector in general and e-procurement utilization in particular. The findings show that though IOISs are promising means for effective collaboration between actors in public sector procurement, it was not entirely so in this case. The analysis demonstrates that the effects of using e-procurement IOIS on procurement practices in the public sector include the offering of basic procurement activities to the detriment of advanced procurement practices, and persistence use of physical documents, signature, contacts, and disjointed third-party systems. As a result, the e-procurement IOIS has become a partial instead of a full online platform. This is attributed to constraining factors in the environment such as lack of ICT devices, high cost of internet data, slow and unstable internet connectivity, and high ICT illiteracy rate among staff of supplier organizations. Accordingly, to derive intended benefits, attention should be paid not only to enablers, but also to constraints that shape the use of IOISs for procurement in the public sector.

This study contributes to research, practice and policy. For research, the study reveals the emergent structures that enable and/or constrain the link between e-procurement practices and IOISs usage (i.e. technology in practice) in the public sector. By identifying these structures, the study extends existing knowledge in IOISs use in the public sector in developing countries. For practice, the study shows that managers of government institutions should not only be interested in implementing digital infrastructures such as GHANEPS but should be equally concerned with how the use of such infrastructures can affect procurement in the public sector. For policy the study calls on governments, particularly in developing countries to create the right structures (i.e. institutional environment and frameworks, and provision of appropriate technological infrastructure) to support IOISs use in the public sector. The study is limited by its single country focus. However, with the principles of interpretive study, the findings are applicable to developing countries with similar context. Future research can look at the creation of public value via e-procurement platform use.

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