Digitalization and Government Corruption in Developing Countries: Towards a Framework and Research Agenda

Abstract

Research focusing on the nexus between digital technologies and government corruption in developing countries has reported mixed findings and painted an incoherent picture. Through a review of 90 relevant studies published over the last two decades we develop an inductive framework that connects 7 defining themes: (1) the broader socioeconomic context of developing countries (2) anti-corruption strategies and strategizing in developing countries (3) digitalization processes (4) strategic role of digital technologies and modalities of anti-corruption change (5) formative structures of government organizations (6) barriers within government organizations and (7) positive and negative effects of digitalization on corruption. Deriving from this framework, we highlight under-researched concerns and outline a research agenda to (1) clarify the links between anti-corruption strategizing and digitalization interventions (2) explicate the materialization of corruption in specific organizational domains, work systems, and processes in developing countries, their embedded nature in the organizational and broader context, and the modalities by which digitalization comes to affect or be affected by it (3) uncover digitalization enabled capabilities and dynamic capabilities in the fight against corruption and (4) embrace methodological diversity such as more processual and long-term studies; ethnographic studies, and methods that bridge quantitative and qualitative insights by exploring novel measures and evidence sources.

Keywords: Digitalization, Government Corruption, Strategic Information Systems, Developing Countries, Literature Review

1. Introduction

While corruption occurs around the world, it has been shown to be endemic in developing countries and to have particularly harmful effects in government administrations associated with public services and socioeconomic outcomes (Bardhan, 1997; Olken & Pande, 2012; United Nations Development Program, 2008; World Bank Group, 1998). In the last few decades, strategic information systems implementations and digitalization initiatives of various kinds have been carried out in developing countries to improve services and to stamp out corruption (Kim, Kim, & Lee, 2009; Neupane, Soar, & Vaidya, 2012; Silva & Hirschheim, 2007; Srivastava, Teo, & Devaraj, 2016; United Nations, 2016).[1] But despite such interventions in different government administration domains across developing countries, their interplay with corruption remains unclear with mixed and sometimes contradictory findings reported in the relevant literature.

There is limited theorization of the nature of endemic corruption in the government administrations of developing countries, unclear understanding of the relationship between digitalization and government corruption, as well as how and why information systems have not fulfilled their potential in helping to curb corruption in such contexts. In response to these issues, we present an in-depth review of relevant literature from the early period of computerization and the use of internet in developing countries in the 1990s to 2019 to understand the strategic application of digitalization in government reforms and anti-corruption efforts in developing countries. This article (1) takes stock of the current knowledge of digitalization and corruption in developing countries and traces the nature of linkages between the two (2) develops a framework to clarify how and why digitalization has been observed to

[1] We use the term digitalization to overcome issues of nomenclature in the literature e.g. studies might refer to ICTs, IT, IS in relation to processes such as innovation, reform, transformation, organizational change etc., all of which invoke the understanding of digitalization as a "range of sociotechnical changes resulting from the adoption of digital technologies" (Legner et al., 2017). We make no distinction between digitalization (digital transformation) and IT transformation given that we consider the organizational context of government primarily (Vial, 2019).

encounter various obstacles in curbing government corruption in developing countries, as well as (3) derives a set of empirical, theoretical and methodological concerns toward an agenda for further work in the area by highlighting under-researched issues and approaches for better understanding the strategic significance of digitalization and its interplay with corruption.

We contribute a framework that systematically integrates current knowledge of digitalization and government corruption in developing countries and highlight avenues for further empirical and theoretical development of the topic. In the next section, a research methodology with details of the literature search, selection, refinement and analysis strategy is presented. We then present findings along with our framework of the linkages between digitalization and government corruption in developing countries and suggestions for further research. Finally, we discuss some limitations of our research and present concluding remarks.

2. Methods

We followed a literature review approach that combines systematic literature review and grounded theory coding techniques (Wolfswinkel, Furtmueller, & Wilderom, 2013). We selected this approach because it ensures "a holistic literature coverage, adequate extraction of meanings and associations between studies as well as thorough analysis" (Senyo, Liu, & Effah, 2019a). Given our aim of rigorously reviewing the extant literature on digitalisation and corruption, we deemed the selected approach suitable in addressing our research purpose (Figure 1).

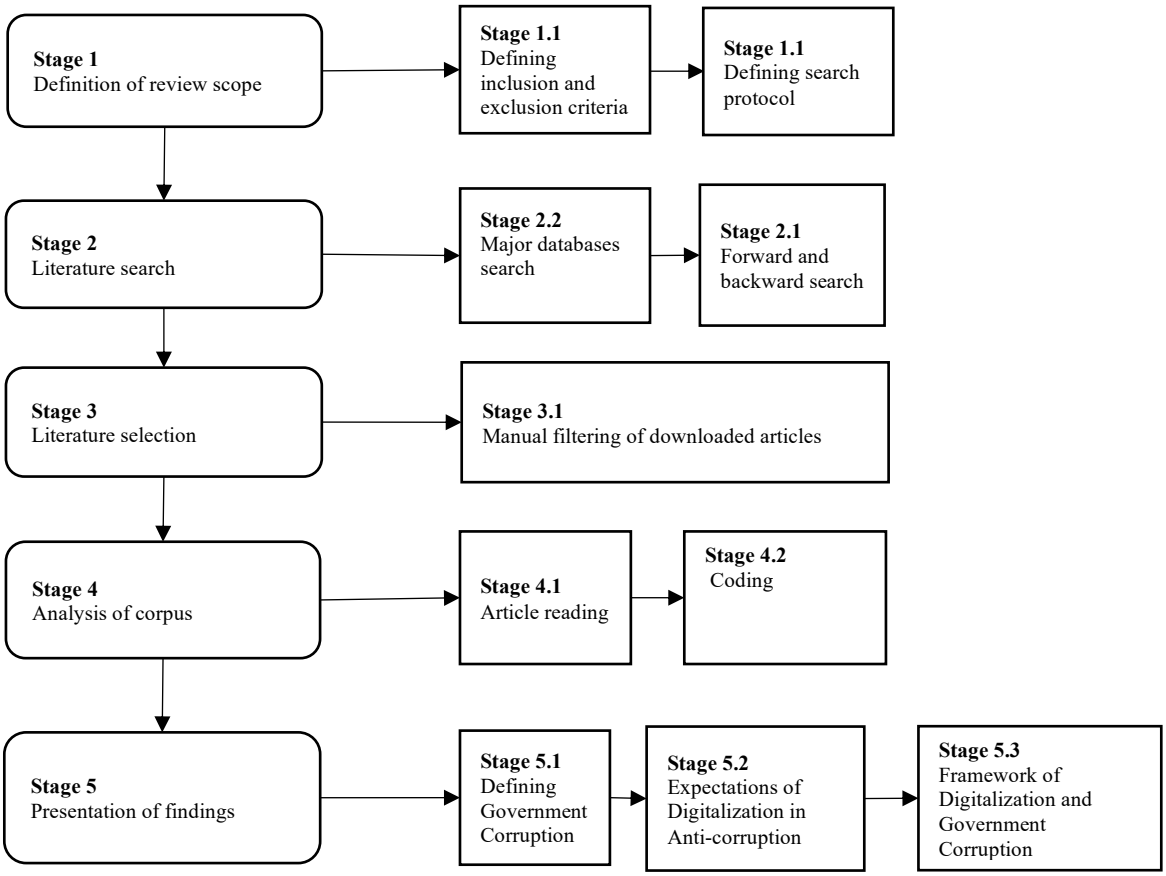

Figure 1: Literature review approach (Adapted from Senyo et al. 2019)

Our review went through five stages: (1) definition of the review's scope (2) literature search (3) literature selection (4) analysis of corpus, and (5) presentation of findings. Appendix 1 provides further details. We began by initially searching four major databases (AIS Library, Scopus, Web of Science and Google Scholar) to understand the coverage of literature and various conceptualisations of digitalisation and corruption in relevant disciplines. Based on the preview of some articles from our initial search, we defined our inclusion and exclusion criteria to primarily cover peer reviewed journals and conference articles. We also defined our search protocol based on combinations of keywords related to "digitalization", "ICT", "information and communication technology", "information system", "information technology", "technology", "developing country" and "corruption".

In line with our literature inclusion and exclusion criteria and the search protocol, we searched the four major databases to ensure that relevant IS, Management, Public Administration, Development, and ICT4D journals were covered given that digitalization and corruption studies have been published in these disciplines from similar research approaches. For each database search, we downloaded the PDF after reviewing the title, keywords, and abstract of each article. Next, we performed forward and backward searches on the articles downloaded (Jane Webster & Watson, 2002). From an initial hit of 2,794 articles matching our selected keywords, we obtained a final set of 90 highly relevant empirical studies after applying our inclusion and exclusion criteria and eliminating duplicates and articles without full text.

We then conducted an iterative literature analysis by reading and coding each selected article to extract data and metadata. We derived open codes from each article based on primary research theme and findings relevant to our focus of digitalization and corruption. Next, we iteratively analysed the conceptual similarity between the open codes to derive axial codes. Finally, we derived selective codes by mapping and integrating as well as refining the axial codes to derive higher-order categories. Based on the analysis of data points from the selected articles, we developed a framework of digitalization and government corruption in developing countries. Descriptive stats, full list of works covered in our analysis and our coding approach are provided in the Appendices.

3. Findings

Of the 90 papers reviewed, three kinds of research were identified: (1) observational studies of digitalization, corruption, and other variables (2) studies of focal digitalization phenomena in a context of corruption and (3) studies of digitalization as an anti-corruption tool. Observational studies that assess relationships between corruption proxies such as ‘corruption perception’ or ‘control of corruption’, digitalization-related variables, and socioeconomic or demographic variables formed the bulk of articles in our sample (n=42). This group is followed by studies

of focal digitalization phenomena in a context of corruption such as adoption and use, failure, unrealized implementation outcomes of technology (n=29). The last group of relatively few papers explicitly explore the role of digitalization as an anti-corruption tool (n=19). Table 1 describes features of the three kinds of research.

Research	Description
Observational studies of digitalization, corruption, and other variables	Quantitative studies that adopt statistical or econometric approaches to draw inferences or to establish relationships between variables. They assess relationships between corruption proxies such as 'corruption perception' or 'control of corruption', digitalization-related variables, and socioeconomic or demographic variables. Studies commonly exploit publicly available cross-country corruption data e.g., Transparency International's corruption perceptions index (CPI), and the World Bank's control of corruption index (CCI), to test hypotheses that may or may not be sensitized by theory, or to develop explanations. Corruption related datasets are combined—as dependent or independent variables—with datasets on digitalization and related variables to assess associations, and less commonly, causation.
Studies of focal digitalization phenomena in a context of corruption	Mostly qualitative case studies where consideration of corruption is not sustained, and comes up only in relation to some focal digitalization phenomena such as adoption and use, failure, unrealized implementation outcomes, etc.
Studies of digitalization as an anti-corruption tool	Mostly qualitative studies that explore the question of whether and how digitalization might work as an anti-corruption tool. A frequent thread in such research is the role of technology in enabling transparency and accountability, based on a theoretical assumption that corruption arises from the agency problem, manifesting through information asymmetry and unchecked monopoly power. Corruption is not considered directly in such studies (largely due to methodological and empirical constraints of observing and measuring corruption) but through perceptions of it, or in relation to the *potential* role of digital technologies in its constraint, such as for transparency, accountability, or some other means (rather than an *actual* role observed in empirical settings).

Table 1: Approaches to research on digitalization and government corruption

Next, we discuss elements of the analysis from our full sample before focusing on the subset of qualitative case studies that provide more details for understanding the 'how' and 'why' of digitalization and government corruption in developing countries. Our framework is derived from the latter subset of papers (studies of focal digitalization phenomena in a context of corruption and studies of digitalization as an anti-corruption tool (n=48)).

3.1 Government corruption

We began our analysis by assessing how corruption is defined and framed as well as understandings of government corruption in the literature (de Graft, 2007). From our sample, we identified various definitions in use (Table 2).

Definition	Study
Abuse/misuse of (public) power for private/personal gain (n=17)	Andersen 2009, Bhuiyan 2011, Charoensukmongkol and Moqbel 2014, Elbahnasawy 2014 Kim 2014, Kim et al. 2009, Kock and Gaskins 2014, Lio et al. 2011, Neupane, Soar, and Vaidya 2014, Neupane, Soar, and Vaidya 2015, Pathak et al. 2009,

	Shrivastava and Bhattacherjee 2014, Shrivastava and Bhattacherjee 2015, Soper 2007, Srivastava et al. 2016, Twinomurinzi et al 2011, Walle at al 2018
Abuse/misuse of (public) office for private/ personal gain (n=15)	Addo 2018, Bhattacherjee and Shrivastava 2018, Corojan and Criado 2012, Hope and Korpoe 2011, Khan and Krishnan 2018, Kock and Gaskins 2013, Krishnan et al 2012, Martinez 2015, Neupane et al. 2012, Oni 2016, Ramasoota 1998, Relly 2012, Saxena 2017, Selke et al. 2008, Silal et al 2019, Syed et al 2019, Xinli 2015
Corruption perception (n=15)	DiRienzo et al. 2007, Jha and Sarangi 2017, Kovacic 2005, Krishnan et al. 2013, Mimbi and Bankole 2016, Mistry 2012, Mistry and Jalal 2012, Nugroho 2014, Prasad and Shivarajan 2015, Sassi and Ben Ali 2017, Shim and Eom 2008, Shim and Eom 2009, Shrivastava and Bhattacherjee 2014, Shrivastava and Bhattacherjee 2015, Zhao et al. 2017
Behavior that "deviates from the formal duties of a public role because of private-regarding (personal, close family, private clique) pecuniary or status gains; or violates rules against the exercise of certain private-regarding behavior" (Klitgaard, 1988, p. 23)	Bailard 2009
Illegal activity in which power (goods and services) holders provide "favors" for a "fee" to those who find the legal route more costly. Corruption involves acts in which a public office is used to enhance a public officer's personal interests, in a manner that goes against the rules of the office (Jain, 2001)	Garcia-Murillo 2013
Reported corruption	Davis 2004
Collective action problem	Kossow and Kukutschka 2017
Decision makers, politicians and other owners of public offices deliberately distort economic policies to support and carry forward their own personal interests, Compromise and infringe impartiality principles for realizing personal benefits.	Sahay and Puri 2008
Inducement to wrong by bribery or other unlawful or improper means (n=1)	Heeks 1998
Misuse of a public or private position for direct or indirect personal gain. (n=1)	Kanyam et al. 2017
Misuse of entrusted authority for private gain (usually focuses on abuse of power in public sector) (UNDP, 2008)	Abu-Shanab et al. 2013
Departure of public officials from rules and norms for private gains (Warren 2004)	Choi 2014
Offering of bribes to public sector officials and the acceptance of such bribes (p.349)	Mahmood 2004
Expression of rent-seeking, patrimonialism, and neopatrimonialism (n=1)	Addo 2016
Extortion, fraud, injustice, nobble, influence peddling, illegal payments and money laundering	Valle-Cruz et al. 2016
Illegal act by definition (McMullan 1961, p.184). Corruption as exploiting public authority for private gains (Aladwani, 2016)	Nam 2018
Not clearly stated (n=30)	Alryalat at al 2013, Amankwah-Safo et al 2018, Ameen and Ahmad 2013, Bellini 2014, Berman and Tettey 2001, Cho and Choi 2004, Choudrie et al. 2017, Goundar 2009, Introna et al. 2010, Krishnan and Teo 2012, Lee and Lio 2016, Masiero 2015, Owusu-Oware et al 2018, Palvia et al 2017, Pankowska 2017, Peterson 1998, Priyatman 2008, Raghupathi and Wu 2011, Rana et al 2013, Rana et al 2014, Senyo et al 2019, Seo and Warman 2011, Silva and Hirschheim 2007, Srivastava et al 2007, Stamati et al. 2015, Stremlau et al. 2015, Therese and Azwe 2016, Vaidya and Myers 2017, Veeraraghavan 2013, Zhao and Xu 2015

Table 2: Definitions of government corruption adopted in the reviewed literature

A majority of studies (n=30) take corruption as a given and do not explicate a working definition. Others adopt corruption perception and related proxies that black box the phenomena (n=15). Of the studies that state a definition, most (n=32) adopt the commonest definition of corruption in circulation—the abuse/misuse of public power (n=17) or office (n=15) for private/personal gain. Although this dominant definition has the merit of encompassing an otherwise complex and multifaceted phenomena comprising different types of actions, behaviours and practices, it suffers from a lack of conceptual clarity and specificity. For example, the definition relies on a clear distinction between 'public' and 'private' although in the context of several developing countries, particularly those in Africa, it has been shown that the lines between public and private are at best blurred and at worst non-existent (Nawaz & Hodess, 2008; O'Neil, 2007; von Soest, 2006).

Furthermore, the dominant definition appears abstract without making concrete what constitutes 'abuse/misuse', what is privately gained and by whom, and whether such private gains are necessarily against the public interest (if one considers the public as a collection of individuals who might assume contingent roles and affinities that supersede their general public membership). For example, in certain developing countries where nepotism and similar corruption are rife, organizational affinities like family and clan appear more salient than an abstract sense of publicness but tacit arrangements might be in place to ensure benefits are fairly rationed rather than hoarded by particular groups (Joseph, 1987, 1996). Furthermore, it has been shown that in many developing countries, public sector corruption is not the preserve of public officials but is actively and beneficially indulged in by private citizens and members of the public who induce government officials (Ufere & Carlson, 2012).

It is also notable that the dominant definition of corruption covers such a wide range of different practices involving one (e.g. theft, self-dealing, sabotage), two (bribery, speed-money, kick-backs) or more individuals (racketeering, influence peddling, collusion), that by

appearing to describe everything it ends up describing nothing really well. For example, the various practices used to instantiate the dominant definition in case studies do not have normative equivalence or universal consideration as equally wrong; theft or fraud might be considered as wrong in many places but influence peddling or bribery might be sociocultural and context specific with more acceptability in certain places than in others where local norms do not permit (Hasty, 2005). In essence, the public-private dichotomy underlying the dominant definition of corruption is not as universal nor as clean-cut as might appear and has shifting western-centric connotations and normativity (Anter, 2014; Antonsen & Beck Jørgensen, 1997) that struggle against everyday realities in developing countries.

Other definitions that attempt specificity appear to fall into circularity as they are based on, rather than independent of, assumptions in the study and thereby violate elements of clear conceptual definition (Suddaby, 2010). Such conceptual unclarity *qua* circularity typically takes the form 'corruption is defined/conceptualized as X because our study shows X'. For example, Kossow & Kukutcha (2017) conceptualize corruption as a collective action problem for the purpose of explaining the relationship between ICT and corruption control through the empowering of citizens and support of civil society. Addo (2018) conceptualized (petty) government corruption as opportunistic crime to explain the role of technology in removing corruption inducing opportunities.

To get a clearer picture of the phenomena of government corruption from the literature, we further examined the various levels of analysis and corrupt entities targeted for or associated with digital intervention (Table 3).

Type of study	Level of analysis	Study
Observational studies of digitalization, corruption and additional variables (n=42)	Cross-country (n=35)	Andersen 2009, Bhattacherjee and Shrivastava 2018, Charoensukmongkol and Moqbel 2014, Choi 2014, DiRienzo et al. 2007, Elbahnasawy 2014, Garcia-Murillo 2013, Hope and Korpoe 2011, Jha and Sarangi 2017, Kanyam et al. 2017, Khan and Krishnan 2018, Kim 2014, Kossow and Kukutschka 2017, Kovacic 2005, Krishnan and Teo 2012, Krishnan et al 2012, Krishnan et al. 2013, Lio et al. 2011, Mimbi and Bankole 2016, Mistry 2012, Mistry and Jalal 2012, Nam 2018, Raghupathi and Wu 2011, Sassi and Ben Ali 2017, Shim and Eom 2008, Shim and Eom 2009, Shrivastava and Bhattacherjee 2014, Shrivastava and Bhattacherjee 2015, Soper 2007, Srivastava et al 2007, Srivastava et al. 2016, Twinomurinzi et al 2011, Walle at al 2018, Zhao and Xu 2015, Zhao et al. 2017

	National (n=6)	Abu-Shanab et al. 2013, Alryalat at al 2013, Bailard 2009, Neupane et al. 2012, Saxena 2017, Valle-Cruz et al. 2016
	Organizational (n=1)	Neupane, Soar, and Vaidya 2014
Studies of focal digitalization phenomena in a context of corruption (n=29)	Organizational (n=12)	Addo 2016, Amankwah-Safo et al 2018, Ameen and Ahmad 2013, Davis 2004, Heeks 1998, Introna et al. 2010, Martinez 2015, Neupane, Soar, and Vaidya 2015, Senyo et al 2019, Vaidya and Myers 2017, Xinli 2015
	National (n=11)	Cho and Choi 2004, Choudrie et al. 2017, Goundar 2009, Mahmood 2004, Nugroho 2014, Oni 2016, Pathak et al. 2009, Peterson 1998, Rana et al 2013, Silal et al 2019, Silva and Hirschheim 2007, Berman and Tettey 2001
	Group/Team (n=2)	Seo and Warman 2011, Therese and Azwe 2016
	Transactions	Prasad and Shivarajan 2015
	Individual	Rana et al 2014
	State	Masiero 2015
	Process	Priyatman 2008
Studies of digitalization as an anti-corruption tool (n=19)	National (n=7)	Bhuiyan 2011, Corojan and Criado 2012, Kim et al. 2009, Owusu, Oware et al 2018, Ramasoota 1998, Stamati et al. 2015, Stremlau et al. 2015
	Organizational (n=4)	Addo 2018, Sahay and Puri 2008, Syed et al 2019, Veeraraghavan 2013
	Work system (n=2)	Bellini 2014, Pankowska 2017
	Provincial	Lee and Lio 2016
	Cross-country (n=3)	Kock and Gaskins 2013, Kock and Gaskins 2014, Relly 2012
	Community	Selke et al. 2008
	n/a	Palvia et al 2017

Table 3: Level of analysis associated with digitalization and corruption

Observational studies consider corruption at the national or cross-country level with less specificity on the range of corruption types at stake or their materialization in specific settings. As a result, there is limited understanding of the nature and mechanics of corruption at the organisational, national and cross-country levels in such studies. Studies that focus on digitalization phenomena in a context of corruption investigate corruption at the organisational, national, group/team, transactions, individual, state and process levels. Similarly, these studies also provide scant details about the nature of corruption in terms of its definition and framing. Studies of digitalization as an anti-corruption tool also consider corruption at the national, organizational, work system, provincial, cross-country and community levels. These studies consider individuals and their practices, corruption within group and teams, corruption at the level of work process, within particular government administrations/agencies, across government administrations/agencies or at the societal level.

3.2 Expectations of digitalization in relation to corruption

Numerous studies of digitalization and corruption present optimism about the implications of digitalization for anti-corruption. However, on closer inspection, this often proves to be based merely on expectation of the potential of digital technologies rather than their demonstrated

effects in particular settings. IS and related disciplines caution against conflation of the potential effects of technology with its actual effects in situated contexts since technology-enabled change is sociotechnical and shaped by contingencies in the organizational and broader environment (Avgerou & Addo, 2017; Orlikowski & Baroudi, 1991; Sawyer & Jarrahi, 2014). Sensitized by such distinction between expectations and outcomes, we first trace the expectations underpinning digitalization for anti-corruption or within government corruption contexts (Table 4).

Digitalization	Expectations of Digitalization in Anti-corruption	Example technologies used	Study
ICT/IT/Information system (unspecified) (n=29)	IT can enable improved business processes which might lead to reduction in corruption	Citizen service centers	Introna et al. 2010
		Digitalized public distribution system (PDS)	Masiero 2015
		E-government services	Krishnan and Teo 2012, Krishnan et al 2012
		Electronic district (E-district) system	Rana et al 2014
		e-Revenue Licence system at Department of Motor Traffic (DMT)	Syed et al 2019
		Free software implemented by a not for profit NGO) for the public health sector in an Indian state	Sahay and Puri 2008
		Management system of 'holding tax'	Selke et al. 2008
		Personnel system, accounting system etc.	Peterson 1998
		Seat/berth reservation system, payroll system, university marks information system, university admissions information system, importer database	Heeks 1998
		TradeNet, GCMS, PAARS	Amankwah-Safo et al 2018, Senyo et al 2019
	IT can enable transparency and monitoring which might lead to reduction in corruption	E-government services	Silal et al 2019
		Electronic Monitoring System (EMS)	Xinli 2015
		E-procurement system	Neupane, Soar, and Vaidya 2015, Nugroho 2014, Seo and Warman 2011
		Financial information systems (FIS)	Ameen and Ahmad 2013
		Information and monitoring systems	Davis 2004, Veeraraghavan 2013
		Internal systems (Intsys), SIAFI, telephone, word document etc.	Martinez 2015
			Berman and Tettey 2001, Mahmood 2004, Vaidya and Myers 2017
	ICT use can help deter corruption		Bhattacherjee and Shrivastava 2018
	ICT development in a country helps reduce corruption		Shrivastava and Bhattacherjee 2014
	To drive implementation of development projects to curb corruption		Therese and Azwe 2016
	ICT penetration and penalty for corruption control		Shrivastava and Bhattacherjee 2015
	IT enables transparency which helps reduce corruption		Pathak et al. 2009
Computing (n=7)	IT can enable transparency and monitoring which might lead to reduction in corruption	Enterprise architecture language, Archimate, for public sector procurement process modelling	Pankowska 2017

		OPEN (Online Procedures ENhancement for civil application)	Cho and Choi 2004, Kim et al. 2009
		OPEN (Online Procedures ENhancement for civil application), Gyandoot (community network system)	Bhuiyan 2011
	IT can enable improved business processes which might lead to reduction in corruption	ERP	Choudrie et al. 2017
		TradeNet	Addo 2016
	Social media enables openness and accountability	Social Media, registers and web sources	Bellini 2014
Connectivity (n=7)	Empower citizens to fight corruption, as tool to engage actively online to unseat powerful actors	Mobile platforms	Twinomurinzi et al 2011
	Corruption hinders e-government maturity	Online services	Khan and Krishnan 2018
	IT might lower transaction costs which might reduce corruption	Government websites	Prasad and Shivarajan 2015
	Social media enables openness and accountability	Social Media	Stamati et al. 2015
	Internet diffusion enables voice and accountability for corruption	Internet	Kock and Gaskins 2013
	Improved connectivity via internet and mobile helps reduce corruption	Internet, cell phone	Relly 2012
	IT can enable improved business processes which might lead to reduction in corruption	TradeNet, GCMS	Addo 2018
Information (n=6)	IT can enable transparency and monitoring which might lead to reduction in corruption	Population information network (PIN)	Ramasoota 1998
	Media through radio can help hold power holders to account and thereby reduce corruption	Radio	Stremlau et al. 2015
	Improve information (validate identities) to reduce corruption	Biometric technology	Owusu-Oware et al 2018
	IT can enable improved business processes which might lead to reduction in corruption	Strategic IS (health information system)	Silva and Hirschheim 2007
	Digitalization of government website to reduce corruption	Ministry websites and egovement portals	Goundar 2009
	ICT helped corruption come to light thereby leading to its reduction		Lee and Lio 2016
Communication	Complaint system might improve information flow leading to better service and reduction of corruption	Online Public Grievance Redressal System	Rana et al 2013
Not clear from study (n=40)			Abu-Shanab et al. 2013, Alryalat at al 2013, Andersen 2009, Bailard 2009, Charoensukmongkol and Moqbel 2014, Choi 2014, Corojan and Criado 2012, DiRienzo et al. 2007, Elbahnasawy 2014, Garcia-Murillo 2013, Hope and Korpoe 2011, Jha and Sarangi 2017, Kanyam et al. 2017, Kim 2014, Kock and Gaskins 2014, Kossow and Kukutschka 2017, Kovacic 2005, Krishnan et al. 2013, Lio et al. 2011, Mimbi and Bankole 2016, Mistry 2012, Mistry and Jalal 2012, Nam 2018, Neupane et al. 2012, Neupane, Soar, and Vaidya 2014, Oni 2016, Palvia et al 2017, Priyatman 2008, Raghupathi and Wu 2011, Sassi and Ben Ali 2017, Saxena 2017, Shim and Eom 2008, Shim and Eom 2009, Soper 2007, Srivastava et al 2007, Srivastava et al. 2016, Valle-Cruz et al. 2016, Walle at al 2018, Zhao and Xu 2015, Zhao et al. 2017

Table 4: Expectations of digital technology effects on corruption in developing countries

In general, digitalization is expected to enable improvements in business processes, enable

transparency and monitoring, as well as deter corrupt behaviours (n=29). Depending on the type of digital technologies—information, computing, communication, and connectivity technologies (Bharadwaj, El Sawy, Pavlou, & Venkatraman, 2013; Vial, 2019: 121)—other specific expectations might be derived in relation to government corruption.

Digital technologies are deployed in the government administrations of developing countries with direct or indirect expectations of effects on corruption. Relatively few studies consider digitalization as an explicit tool for anti-corruption (Table 4). For such studies, expectations of digital technologies might be directly informed by the expectations of an anti-corruption strategy, and its hypothesis of the causes and materialization of a given corruption instance (Kim et al., 2009; Saddler, 2007; Syed & Bandara, 2019; Veeraraghavan, 2013).

Informed by research in the sociotechnical tradition, we reviewed the literature with an eye toward assessing the various ways digital technologies are sociotechnically implicated with corruption within government administration contexts and broader socioeconomic contexts of developing countries. Specifically, our coding of the literature was influenced by information systems research on developing countries that has drawn attention to the significance of context generally, and the salience of the developing country context in shaping focal technology phenomena (Avgerou, 2017; Avgerou & Madon, 2004). This approach is justified because of its potential to shed light on puzzles presented in the literature such as (1) whether and how digitalization's implications for government corruption in developing countries differs from those elsewhere or digitalization more generally (2) why corruption appears endemic in developing countries and how such endemic corruption interplays with digitalization (3) why digitalization has been suggested to perform below expectation in the fight against government corruption in developing countries.

3.3 Toward a Framework of Digitalization and Government Corruption in Developing Countries

Our inductive framework (Figure 2) and subsequent sections synthesize extant knowledge on digitalization and government corruption in developing countries.

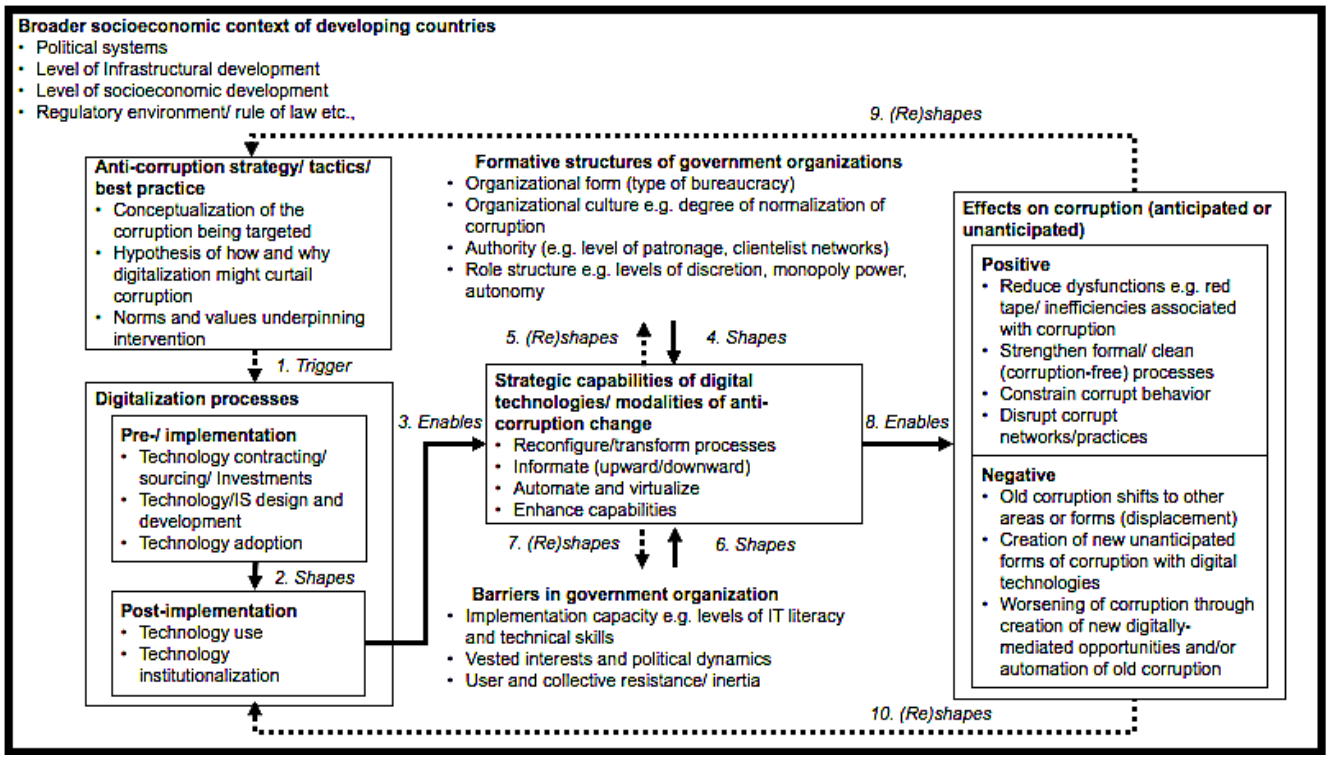

Figure 2: Key issues identified from literature on digitalization and government corruption in developing countries. Arrows only indicate suggested sequences and links in the literature rather than established causal or statistical associations. Solid arrows represent issues reported in the literature and dotted arrows represent underexplored or unexplored issues.

Figure 2 summarizes issues and linkages that emerged from our analysis and suggests that within the broader context of developing countries, anti-corruption strategies, 'best practices' or tactics may trigger a set of digitalization processes that might enable the strategic benefits of digital technologies to be realized as modalities of anti-corruption change in specific government administration settings under a set of formative structures and barriers that influence positive or negative outcomes with respect to corruption.

The Phenomena (content) of digitalization and corruption

Given the significance of context in sociotechnical change (Avgerou, 2001, 2019), we conceptually distinguish from the literature the focal phenomena of digitalization and corruption (the content of change) from its organizational (Ein-Dor & Segev, 1982) and broader context (Hayes & Westrup, 2012; Njihia & Merali, 2013). We identified the content of digitalization as involving strategic, best practice, or tactical motivations that trigger technology investments, design and development, sourcing and adoption of digital technologies to be used and institutionalized with a view to enacting strategic benefits of digital technologies to create modalities of anti-corruption change that might enable effects on the levels or types of corruption. Each of these constituent elements in the literature are explicated in turn and their connections assessed.

Anti-corruption strategy

Despite an established view that structure and processes follow strategy (Chandler, 1962), not all organizational reforms involving digital technologies in developing countries are strategic. While some technology implementations might be guided by an organizational or national strategy, others might be 'me too' (copycat) implementations, tactical (*ad hoc*), or aspiring to some set of 'best practices', no matter how ill-fitting (Andrews, 2012).

In the literature on controlling corruption there are two notable countries, Hong Kong and Singapore, that have managed to stamp out corruption within a relatively short period of time (Klitgaard, 1991). In the case of Singapore, often cited as a poster child of anti-corruption, the reform efforts, often linked to digitalization, were based on an explicit national anti-corruption strategy that was aligned with the country's socioeconomic development plans (Hanna & Knight, 2012; Hin, 2007; Lim Kah Hwee, 2016; Yang & Wang, 2013). Singapore's anti-corruption strategy framed corruption primarily as an issue of legal and ethical violation and envisaged digitalization as playing a role in strengthening monitoring, compliance, and law enforcement to improve trust and confidence in public organizations (Quah, 2001).

The use of digital technologies was also part of an overall strategic vision to digitalize all government agencies and to transform the public sector (Ha, 2013; Hin & Subramaniam, 2005). Singapore's case illustrates the importance of having (1) an underpinning anti-corruption strategy to guide the development and deployment of digital technologies (2) a holistic national anti-corruption strategy that integrates digitalization as part of broader public sector reforms and (3) the establishment of an independent anti-corruption watchdog organization with strong investigative and enforcement powers to work alongside administrative reform efforts (Klitgaard, 1991).

For example, in the areas of international trade and customs clearance, Singapore's development and deployment of the TRADENET platform—an EDI system to integrate multiple stakeholders and to streamline processes—was aligned with the country's strategy to become a world-leading port nation with high efficiency and low corruption to overcome its natural disadvantage of small size while leveraging its ideal geographic location for shipping (King & Konsynski, 1995; Teo, Tan, & Wei, 1997). Just a few years after TRADNET implementation Singapore became a remarkable success story not only for its world-leading port sector but also as the least corrupt nation in Asia and one of the least corrupt in the world that is noted for the integrity of its public servants (Civil Service College (Singapore), 2015). Digitalization was carried out alongside wholesale reforms and strict law enforcement that ensured the routine jailing of corrupt government officials and individuals (Singapore Customs and Corrupt Practices Investigation Bureau, 2018).

Other developing countries such as Ghana and Mauritius that subsequently adopted Singapore's TRADENET as a best practice (De Wulf, 2005) have not had underpinning anti-corruption strategies as ambitious or encompassing as Singapore's. In Ghana's case, TRADENET was implemented within a remit of improving efficiencies in trade clearance but despite the potential of the technology, corruption continued to persist and co-exist alongside

other improvements within customs and the ports (Addo, 2016; Addo & Senyo, 2020). Table 5 summarizes motivations underpinning digitalization and corruption in the literature.

Is digitalization strategic?	Nature of digitalization and anticorruption approach	Study
Yes (n=23)	Strategic (n=18)	Bhuiyan 2011, Cho and Choi 2004, Davis 2004, Goundar 2009, Heeks 1998, Kim et al. 2009, Martinez 2015, Masiero 2015, Nugroho 2014, Owusu-Oware et al 2018, Ramasoota 1998, Silal et al 2019, Silva and Hirschheim 2007, Stamati et al. 2015, Syed et al 2019, Twinomurinzi et al 2011, Veeraraghavan 2013, Xinli 2015
	Best practice (n=5)	Addo 2016, Addo 2018, Amankwah-Safo et al 2018, Kock and Gaskins 2013, Senyo et al 2019
No	Tactical	Choudrie et al. 2017, Stremlau et al. 2015
Not clear from study (n=23)		Ameen and Ahmad 2013, Bellini 2014, Berman and Tettey 2001, Corojan and Criado 2012, Introna et al. 2010, Kock and Gaskins 2014, Lee and Lio 2016, Mahmood 2004, Neupane, Soar, and Vaidya 2015, Oni 2016, Palvia et al 2017, Pankowska 2017, Pathak et al. 2009, Peterson 1998, Prasad and Shivarajan 2015, Priyatman 2008, Rana et al 2013 Rana et al 2014, Sahay and Puri 2008, Selke et al. 2008, Seo and Warman 2011, Therese and Azwe 2016, Vaidya and Myers 2017

Table 5: Association of digitalization with anti-corruption strategies in developing countries

A bulk of the literature (n=23) does not indicate the linkage of digitalization to an anti-corruption strategy. Others suggest motivations and goals that are not uniquely strategic for the organization or context, but might copy 'best practice' (Addo, 2016; Amankwah-sarfo, Boateng, & Effah, 2018; Kock & Gaskins, 2013; Senyo, Liu, & Effah, 2019b), or be tactical i.e., have short-term expectations derived from a general belief in the potential of digital technologies to transform organization (Stremlau, Fantini, & Gagliardone, 2015).

Overall, this remains an important area for further research as a number of pertinent questions remain unexplored in the literature. For example, it remains unclear (1) how anticorruption strategies are formulated and implemented in developing countries and by whom. Understanding this might provide insights into the power dynamics, values and influences that animate anti-corruption efforts in such contexts (2) how various anticorruption strategies come to be linked with digitalization to trigger specific processes (rather than others). The role of consultants and technology vendors needs to be better understood (Veeraraghavan, 2013), as does the role of political actors and decision-makers because there is evidence that deployment of technology can be a highly political rather than objective process, and linked to vast corruptible networks (Sahay, 2008) (3) the degree of dynamism of such strategies and how

they adapt to feedback from the environment and particularly from ongoing digitalization effects on corruption. For example, the IS strategy literature has distinguished between strategy and 'strategizing' (Besson & Rowe, 2012; Levy, Powell, & Galliers, 1999), with the later emphasising the dynamism of strategic play i.e., strategy-as-practice and aligning-in-practice—what "managers and other organizational actors do in their day-to-day activities to achieve alignment" (Karpovsky & Galliers, 2015: 137).

Digitalization processes

Given its endemic nature in developing countries, it should come as no surprise that all stages of digitalization from pre-implementation to post-implementation are associated with government corruption. Technology investments have been associated with mixed results on corruption (Charoensukmongkol & Moqbel, 2014), and government digitalization projects, like other public sector projects in developing countries are prone to corruption (Damoah, Akwei, Amoako, & Botchie, 2018). Table 6 summarizes corruption related issues associated with various stages of digital technology deployment and use.

Stage of digitalization	Aspect of process	Study
Post-implementation (n=18)	Institutionalization	Addo 2016
	Use (n=17)	Addo 2018, Amankwah-Safo et al 2018, Davis 2004, Heeks 1998, Kock and Gaskins 2013, Martinez 2015, Nugroho 2014, Owusu-Oware et al 2018, Ramasoota 1998, Senyo et al 2019, Silal et al 2019, Stamati et al. 2015, Stremlau et al. 2015, Syed et al 2019, Twinomurinzi et al 2011, Veeraraghavan 2013, Xinli 2015
Pre-Implementation (n=7)	Institutionalization (n=4)	Bhuiyan 2011, Choudrie et al. 2017, Kim et al. 2009, Silva and Hirschheim 2007
	Technology/IS design and development	Goundar 2009
	Use	Cho and Choi 2004, Masiero 2015
Not clear from study (n=23)		Ameen and Ahmad 2013, Bellini 2014, Berman and Tettey 2001, Corojan and Criado 2012, Introna et al. 2010, Kock and Gaskins 2014, Lee and Lio 2016, Mahmood 2004, Neupane, Soar, and Vaidya 2015, Oni 2016, Palvia et al 2017, Pankowska 2017, Pathak et al. 2009, Peterson 1998, Prasad and Shivarajan 2015, Priyatman 2008, Rana et al 2013, Rana et al 2014, Sahay and Puri 2008, Selke et al. 2008, Seo and Warman 2011, Therese and Azwe 2016, Vaidya and Myers 2017

Table 6: Corruption related issues at various stages of digitalization

Digitalization and its technologies are institutional and involve actors and stakeholders with diverse interests acting across domains from the local to the global (Avgerou, 2003). Actors involved might span the public-private spheres, for example, technology consultants, vendors and entrepreneurs might engage in public-private partnerships with government actors (Hartnett, Daniel, & Holti, 2012; Saint-Martin, 2000). In the pre-implementation stage, vast sums of typically donor money are invested in sourcing, purchasing and contracting and this creates susceptibility to the kinds of corruption associated with public project spending in developing countries such as bribery for contracts, kickbacks, self-dealing, cronyism or even the theft of project funds (Locatelli, Mariani, Sainati, & Greco, 2017).

During the design, development and adoption of anti-corruption systems, vested interests keen on preserving the status quo might limit the potential of technology by pushing for sub-optimal system configurations that may be less threatening to established corrupt practices (Addo, 2017), or by sabotaging digitalization in other ways (Veeraraghavan, 2013: 249). Digital systems that come to be used in government have therefore typically been pre-shaped by corruption and vested interested with such influences conditioning the nature and extent of use, as well as the possibility, nature and extent for institutionalization into existing practices. Corruption has also been associated with the use and institutionalization of digital artefacts during both implementation and post-implementation. For example, processes for vendor, partner and consultant selection during digitalisation projects might be associated with politicization, real or perceived corruption, and powerful officials might chose to end digitalization initiatives at whim once there is change in political power or leadership (Sahay, 2008; Silva & Hirschheim, 2007).

Strategic capabilities of digital technologies and modalities of anti-corruption change

Digital technologies or their uses do not necessarily cause anti-corruption effects. The IS literature has distinguished between objective technology (material artefacts and systems) and

enacted technology (systems under subjective use in particular social and organizational contexts)(Cordella & Iannacci, 2010; Fountain, 2001). Under certain formative conditions, digital technologies might enable the strategic capabilities of information and digital technologies to be realized as modalities for anti-corruption change.

Strategic capabilities of digital technologies identified in the IS literature include automation (replacing human labour in processes), informating (providing more and better information about organizational activities upward toward management and downward toward employees and users), and transformation (fundamentally redefining processes and relationships) (Dehning, Richardson, & Zmud, 2003). Digital technologies have also been used to strategically enhance or enable organizational capabilities. Table 7 summarizes the strategic capabilities of digital technologies in relation to the modalities of anti-corruption change they have been associated with in the literature.

Strategic role of digital technologies (Types)	Implication in practice	Study
Reconfigure/ Transformation processes (n=9)	Digitalization was undertaken to improve business processes (Customs and port processes) and reduce corruption	Addo 2018, Amankwah-Safo et al 2018, Senyo et al 2019
	Reduce corrupt practices associated with NHIA such as multiple identifies, fake IDs, fraudulent billing, ghost patients and impersonation	Owusu-Oware et al 2018
	Curbed workaround processes that enable corruption	Syed et al 2019
	ERP implementation meant to improve processes to increase efficiency and reduce corruption	Choudrie et al. 2017
	Part of broader strategy to improve hospital management and help in the fight against corruption in Guatemala's two largest hospitals	Silva and Hirschheim 2007
	Computerization was purposefully aimed to fight leakage (“rice mafia”) in the PDS	Masiero 2015
	TradeNet intended to streamline processes to reduce inefficiencies and lack of transparency and monitoring that leads to corruption	Addo 2016
Informate downward (n=7)	Government ministries embarked on digital transformation of Fiji to ensure transparency	Goundar 2009
	Various Greek government initiatives make government more transparent to citizens	Stamati et al. 2015
	Radio might enable citizens gain information about government; call-in programs might allow citizens to hold office holders to account	Stremlau et al. 2015
	OPEN allows disclosure and tracking of citizen requests thereby enabling transparency	Cho and Choi 2004, Kim et al. 2009
	E-procurement system allows more visibility for all transacting parties	Nugroho 2014
	System provides accessible information to various stakeholders to enable transparency in procurements	Martinez 2015
Informate upward (n=4)	The Electronic Monitoring System (EMS) helps monitor activities	Xinli 2015
	Population surveillance and civil registration services	Ramasoota 1998, Veeraraghavan 2013
	Various systems meant to enhance transparency and management controls	Davis 2004
Enhance capabilities (n=4)	Internet enables citizens to have voice and demand accountability to fight government corruption	Kock and Gaskins 2013

	To enable citizen mobilization online to unseat the powerful groups	Twinomurinzi et al 2011
	Technology to render capabilities for 'panoptic' control	Heeks 1998
	As part of broader e-government initiatives to modernize government	Bhuiyan 2011
Automate/virtualize	To enable citizen use e-government services as anticorruption tools	Silal et al 2019
Not clear from study (n=23)		Ameen and Ahmad 2013, Bellini 2014, Berman and Tettey 2001, Corojan and Criado 2012, Introna et al. 2010, Kock and Gaskins 2014, Lee and Lio 2016, Mahmood 2004, Neupane, Soar, and Vaidya 2015, Oni 2016, Palvia et al 2017, Pankowska 2017, Pathak et al. 2009, Peterson 1998, Prasad and Shivarajan 2015, Priyatman 2008, Rana et al 2013, Rana et al 2014, Sahay and Puri 2008, Selke et al. 2008, Seo and Warman 2011, Therese and Azwe 2016, Vaidya and Myers 2017

Table 7: Strategic capabilities of digital technologies as modalities of anti-corruption change

When digital technologies are strategically deployed for reconfiguration and transformation, the essence is to improve business processes to curb the use of unofficial channels, reduce corrupt practices, and fight leakage of revenues or public goods (Addo, 2018; Amankwah-sarfo et al., 2018; Choudrie, Zamani, Umeoji, & Emmanuel, 2017; Senyo et al., 2019b). Where digital technologies were strategically used to informate downward, the essence was to provide more information to citizens in an effort to deepen transparency and to curb shoddy practices that thrive on opaque processes (Goundar, 2009; Kim & Cho, 2005; Stamati, Papadopoulos, & Anagnostopoulos, 2015). On the other hand, where digital technologies are strategically deployed to informate upwards, the motivation was to empower stakeholders to monitor and scrutinize actors in positions of power (Davis, 2004; Ramasoota, 1998; Veeraraghavan, 2013). To enhance capabilities, digital technologies were used in unconventional ways to fight corruption through online mobilisation and protests as well as demand for accountability (Kock & Gaskins, 2013; Twinomurinzi, 2011). Lastly, digital technologies were strategically used for automation to curb corruption associated with physical or human-mediated processes (Silal, Jha, & Saha, 2019). Given that majority of extant literature have not considered the strategic use of digital technologies for fighting government corruption, a fertile opportunity is presented for future research to systematically explore.

The organizational and broader context of digitalization and corruption

We assess how the organizational settings of government administration and the broader context of developing countries shape the enactment of various modalities of anti-corruption enabled by the strategic capabilities of digital technologies. Such consideration of context is key to unravelling the puzzles identified in section 3.2 (1) whether and how digitalization's implications for government corruption in developing countries differs from those elsewhere or digitalization more generally (2) why corruption appears endemic in developing countries and how such endemic corruption interplays with digitalization (3) why digitalization has been suggested to perform below expectation in the fight against government corruption.

Broader socioeconomic context of developing countries

Cross-national studies have associated corruption with lower levels of socioeconomic development although the direction of causality remains debatable (Bardhan, 1997; Olken & Pande, 2012). Table 8 presents various aspects of the broader socioeconomic context of developing countries and their manifestations in shaping corruption and digitalization.

Aspect of broader national context	Salience/manifestation	Study
Socioeconomic development (n=15)	Physical interactions in the port coupled with shadow networks enabled corruption	Amankwah-Safo et al 2018, Senyo et al 2019
	General acceptability of corruption across society and public organization	Heeks 1998
	Parasitic relationships in processes that foster corruption, Income and livelihood	Syed et al 2019, Veeraraghavan 2013
	Endemic corruption across society	Davis 2004
	IT failed to stamp out corruption as behavioral and socioeconomic conditions are not adequately considered	Addo 2018
	Neopatrimonial context of country shaped TradeNet anti-corruption efforts	Addo 2016
	Social influence enabled adoption and continued use of system	Nugroho 2014
	Previously, there was more physical interaction and limited information	Goundar 2009
	State effort for efficient surveillance of population and civil registrations to reduce fraud and corruption	Ramasoota 1998
	There is high level of greed associated with power minority groups, leading to corruption	Twinomurinzi et al 2011
	Supervision departments of local governments and anti-corruption agencies collaboration was critical	Xinli 2015
	Social and cultural factors such as gender, poverty, level of education, class, caste, age, and social exclusion can all directly impede the use of computers in developing dialogue with government using ICTs	Bhuiyan 2011
	Misclassification of poverty line changed dynamics of demand and supply that pushed ration shops to divert to private market to stay afloat	Masiero 2015
Political systems (n=7)	Agent of change turn to become agent of exploitation and corruption	Vaidya and Myers 2017
	Implementation of SIS was halted after elections brought in new political regime; reforms staff and SIS staff all fired	Silva and Hirschheim 2007
	Strong political leadership at state level enabled implementation in spite of weaker federal support	Choudrie et al. 2017
	Network of actors within ICT4D project chain are responsible for corruption	Sahay and Puri 2008
	Agency and ministerial structure linked to broader political regime	Martinez 2015

	Rigid legalism as the underlying principle for accountability with clientelism as the rationale for selecting policies and objectives	Stamati et al. 2015
	Patronage politics shapes radio programs and conditions their potential to enable accountability	Stremlau et al. 2015
Infrastructural development (n=3)	Citizen's did not previously make their voices heard for accountability, hence the persist of corruption	Kock and Gaskins 2013
	Unavailability of an integrated socio-technical approach to fight corruption in the health sector	Owusu-Oware et al 2018
	Corruption occurs due to limited computer efficacy of citizen and e-readiness for e-government participation	Silal et al 2019
Regulatory environment/ rule of law	OPEN was backed by strong regulation and enforcement	Cho and Choi 2004, Kim et al. 2009
Not clear from study (n=21)		Ameen and Ahmad 2013, Bellini 2014, Berman and Tettey 2001, Corojan and Criado 2012, Introna et al. 2010, Kock and Gaskins 2014, Lee and Lio 2016, Mahmood 2004, Neupane, Soar, and Vaidya 2015, Oni 2016, Palvia et al 2017, Pankowska 2017, Pathak et al. 2009, Peterson 1998, Prasad and Shivarajan 2015, Priyatman 2008, Rana et al 2013, Rana et al 2014, Selke et al. 2008, Seo and Warman 2011, Therese and Azwe 2016

Table 8: Broader national context and its salience for corruption and digitalization

Corruption in developing countries persist due to socioeconomic issues such as low-income levels and distinctive political economy (Robinson, 1998), as well as cultural issues such as neopatrimonialism and strong informal ties (Addo & Senyo, 2020; Hopper, 2017). When corruption becomes endemic, select groups of powerful people benefit by using their influence to tame or capture the political system (Awofeso & Odeyemi, 2014). Given that people responsible for fixing the political system are embedded in corrupt networks, agents of change become agents of corruption (Sahay, 2008; Vaidya, Myers, & Myers, 2017).

Corruption also thrives in developing countries due to the absence of infrastructural development such as internet penetration (Kock & Gaskins, 2013). In some developing countries, access to digital infrastructure such as reliable internet and digital platforms is a challenge (Bhuiyan, 2011; Owusu-oware & Boateng, 2018). This is worsened by low digital literacy and computer skills of citizens (Silal et al., 2019), all of which make citizens unable to fully utilise digital technologies for anti-corruption.

Formative structures of government administration

Digitalization processes in organizations are not acontextual but rather occur under formative conditions that imbue them with meaning, legitimacy, and endurance (Ciborra & Lanzara,

1994). In the government administrations of developing countries, particular structures have been identified as shaping the enactment of strategic capabilities of digital technologies and modalities for anti-corruption. Table 9 presents examples from the literature.

Structures in formative context	Salience/ manifestations	Study
Nature of bureaucracy (n=14)	Bureaucracy is politicized and influenced by powerful politicians	Martinez 2015, Vaidya and Myers 2017
	Strongly coupled relationships between corrupt actors	Owusu-Oware et al 2018
	Strong support of manual interactions	Goundar 2009
	Unavailability of clear channels to demand accountability	Kock and Gaskins 2013
	Limited openness and accountability	Stamati et al. 2015, Veeraraghavan 2013
	Normalized corruption and patronage in the government sphere intertwined with societal	Davis 2004
	Strong administration capacity and existing infrastructures enabled success	Cho and Choi 2004, Kim et al. 2009, Xinli 2015
	Statutes that regulate organizational arrangement of Ministry was obstacle to SIS	Silva and Hirschheim 2007
	Facilitating conditions and top management support enabled adoption and use	Nugroho 2014
	Decentralized district level administration enabled implementation	Ramasoota 1998
Organizational culture (degree of normalization of corruption) (n=9)	Agents internalize bureaucratic culture and practices	Heeks 1998
	Corruption has been normalized in the implementation of ICT4D project, so actors are willing to deal with people who will reason with them in the implementation of projects	Sahay and Puri 2008
	Formation of patrimonial and bureaucratic networks	Addo 2018
	Mild punishment and sometime no action were taken against corruption actors	Amankwah-Safo et al 2018, Senyo et al 2019
	Parasitic structure of corruption	Syed et al 2019
	Normalized corruption and patronage in the government sphere intertwined with societal	Stremlau et al. 2015
	Flattening hierarchies and decentralizing access to information on to the desks of all employees and in promoting associated changes in power within organizations, are seen as a direct threat to many senior staff, who then block adoption	Bhuiyan 2011
	Culture has a strong impact within the context of developing countries, too. Older individuals and those who travelled abroad were respected more than others. While aspects pertaining to the working conditions are often disregarded by studies conducted in developed countries (e.g., existence of equipment, infrastructure) [...] for developing countries may be important factors, governing and affecting the working practices	Choudrie et al. 2017
Role structure (n=3)	Citizens are not empowered to use e-government services as anticorruption tools	Silal et al 2019
	Customs officers have excessive discretion and monopoly and low accountability	Addo 2016
	Role of ration dealership exposes them to risks that can only be minimized by leaking to the free market	Masiero 2015
Authority	Powerful individuals have access to government power as result of position they occupy	Twinomurinzi et al 2011
Not clear from study (n=21)		Ameen and Ahmad 2013, Bellini 2014, Berman and Tettey 2001, Corojan and Criado 2012, Introna et al. 2010, Kock and Gaskins 2014, Lee and Lio 2016, Mahmood 2004, Neupane, Soar, and Vaidya 2015, Oni 2016, Palvia et al 2017, Pankowska 2017, Pathak et al. 2009, Peterson 1998, Prasad and Shivarajan 2015, Priyatman 2008, Rana et al 2013, Rana et al 2014, Selke et al. 2008, Seo and Warman 2011, Therese and Azwe 2016

Table 9: Salient structures in the formative context of government organizations that shape digitalization and corruption

Instances of formative structures that foster corruption in developing countries include the nature of bureaucracy, organisational culture of normalised corruption, role structure and

authority. Given that developing countries are characterised by limited digital infrastructure development, government processes are largely manual (paper-based) or semi-digitalised, with high levels of red tape, opaqueness and rigidity (Guriev, 2004; Hull, 2012). Due to the level of frustration associated with bureaucratic processes, citizens are often induced to use unofficial channels to receive swift services, which leads to emergence of corruption in government administrations (Stapenhurst & Langseth, 1997). In addition, corruption in developing countries is enabled by obsolete laws and unclear regulatory frameworks that work against digitalization and anti-corruption measures (Effah, 2016). For instance, there are laws in some developing countries that deem electronic signatures as null and void. Physical signature is required from government actors who use this opportunity to extort or induce bribes.

Corruption is also enabled and normalized by mild punishment and sometimes no action against corrupt actors (Amankwah-sarfo et al., 2018; Senyo et al., 2019b). Given such impunity, the weak political and justice systems, citizens in developing countries are not empowered to use digital technologies to fight corruption for fear of victimization. Powerful individuals who perpetuate corruption occupy high-level government positions and use the power of their offices to frustrate anti-corruption interventions, victimise and persecute anti-corruption campaigners (Twinomurinzi, 2011).

Digitalisation alone is unlikely to change corruption in developing countries if formative structures are not considered holistically. While the extant literature has identified some formative structure manifestations, there is still limited knowledge on how digitalisation can be used strategically to influence these.

Barriers in government organizations

Aside the enduring organizational structures suggested to shape strategic capabilities of digital technologies and their anti-corruption modalities, barriers within developing country government have also been suggested in the literature. Such barriers are typically attributed to

individuals or collectives (rather than structures *per se*) and manifest their salience in myriad ways. Table 10 summarizes some barriers and their manifestations found from the literature.

Row Labels	Barriers (Manifestations)	Author-date
Vested interests/ organizational politics (n=12)	Citizens' have not believed in the power of using online platforms to unseat the powerful groups as well as fear of victimization	Twinomurinzi et al 2011
	Formation of workaround business processes to circumvent official processes	Syed et al 2019
	Powerful corrupt actors frustrate anticorruption measures to protect their interest	Amankwah-Safo et al 2018, Senyo et al 2019, Veeraraghavan 2013
	Presence of bureaucratic culture processes that fuels vested interests	Vaidya and Myers 2017
	Presence of corruption ensure Custom officers get additional income and favors	Addo 2018
	Political interests and existing power structures co-opt openness and accountability mechanisms like radio call-in programs	Stremlau et al. 2015
	Corruption, as conceptualized in citizens' perception, does not interest solely the ration dealers, but a system of actors intertwined with the public and private sectors	Masiero 2015
	Various actors subverted technology for their interests	Heeks 1998
	Issues of ownership and control. Control over access to information and over its quality and relevance	Ramasoota 1998
	Network of corrupt actors in ICT4D project demand bribes in the implementation phases of projects	Sahay and Puri 2008
User resistance (n=6)	In the beginning, officials in the SMG were reluctant to use OPEN because of the increased workload. The civil officials' complaints and concerns also arose from the reduced possibility of benefiting from corruption	Kim et al. 2009
	Local actors abandoned practices once consultants from USA had left	Choudrie et al. 2017
	Resistance based on core beliefs of old timers; engineer was pushed out by line managers who kept blocking initiatives	Silva and Hirschheim 2007
	Customs officers insisted on using paper declaration forms despite full digitalization capabilities of TradeNet	Addo 2016
	Moral disengagement to justify corruption	Martinez 2015
	Low user resistance as user satisfaction was high	Xinli 2015
Capacity (n=6)	Citizen's did not have avenues to voice concern and demand accountability to reduce corruption	Kock and Gaskins 2013
	Digital literacy of citizen and limited e-readiness	Silal et al 2019
	Lack of biometric technology and associated database integration leads to fraud, impersonation and "ghost" patient	Owusu-Oware et al 2018
	privacy, security, data management, accessibility, social inclusion, governance, information policy issues, and participation	Stamati et al. 2015
	Bangladesh public administration suffers from an acute shortage of trained personnel, which limits its efficient operation	Bhuiyan 2011
		Nugroho 2014
Inertia	People still not comfortable transacting online, unavailability of technological infrastructure	Goundar 2009
Organized/ collective resistance	Various interests collectively act against digitalization and reforms	Davis 2004
Not clear from study (n=22)		Ameen and Ahmad 2013, Bellini 2014, Berman and Tettey 2001, Cho and Choi 2004, Corojan and Criado 2012, Introna et al. 2010, Kock and Gaskins 2014, Lee and Lio 2016, Mahmood 2004, Neupane, Soar, and Vaidya 2015, Oni 2016, Palvia et al 2017, Pankowska 2017, Pathak et al. 2009, Peterson 1998, Prasad and Shivarajan 2015, Priyatman 2008, Rana et al 2013, Rana et al 2014, Selke et al. 2008, Seo and Warman 2011, Therese and Azwe 2016

Table 10: Organizational barriers shaping digitalization and corruption

Five barriers to anti-corruption are evident in the literature: vested interests, user resistance, capacity, inertia, organized/collective resistance. Vested interest occurs when powerful people influence or take steps protect their source of corruption benefits. Powerful actors sabotage digital technology implementation projects that are considered a threat to their vested interested (Addo, 2016; Amankwah-sarfo et al., 2018; Senyo et al., 2019b; Veeraraghavan, 2013). In cases where digital technologies are deployed to curb corruption, corrupt actors create workaround processes to circumvent official processes (Syed & Bandara, 2019). In terms of resistance, two forms – user and collective resistances emerged as barriers to ant-corruption digitalisation. User resistance occurs when individuals object to digital technology changes (Addo, 2016) while collective resistance emerges when an organized group such as a department, team or entire organizations object to anti-corruption measures(Davis, 2004; Masiero, 2015). Though some of the resistances are based on issues such as beliefs and dissatisfaction, majority has to do with vested interest to protect a broken system that ensure additional income.

In addition, capacity issues such as limited organizational capabilities and lack of digital skills development are also identified as barriers to anti-corruption digitalisation (Bhuiyan, 2011; Hunnius & Schuppan, 2013; Owusu-oware & Boateng, 2018). Lastly, inertia on the part of responsible actors to implement anti-corruption measures. Inertia occurs in the form of deliberate neglect, slow pace or non-trust in digital technologies (Goundar, 2009). As corrupt actors are afraid of the capabilities of digital technology to block corruption loopholes, they are always averse and slow to the use of digital processes. Though few studies have pointed to anti-corruption digitalization barriers, there is still a need for more studies on how barriers manifest and why they persist in developing countries despite digitalization.

Effects of digitalization on government corruption in developing countries

Given that sociotechnical processes are emergent rather than fully planned/determined, the effects of digitalization on government corruption are not a given. Outcomes might be intended or unintended, and positive or negative. Four possible types of effects on corruption might emerge from the enactment of digitalization in developing country governments: positive intended effects, positive unintended effects, negative intended effects, and negative unintnded effects. Table 11 describes actual negative and positive effects documented in the literature (rather than expectations or assumptions based on the potential of digital technologies).

Positive effects	Negative Effects	Study	Intended	Unintended
	Efforts to curb corruption with SIS was marred by political wrangling and lack of political will by new administration	Silva and Hirschheim 2007		x
	E-government initiatives that have been implemented have little to no effect on increasing transparency and decreasing corruption	Oni 2016		x
	In African bureaucracies, information systems fail or underperform more often than they succeed, because the saints are few, the demons are many, the wizards are inappropriate, the systems are complex, and the organizations are weak	Peterson 1998		x
	Computers in African states fails to produce the intended results (such as corruption control) because the trajectory of development of bureaucratic institutions in Africa has resulted in internal and external contexts that differ fundamentally from those of the Western states within which computing, and information technology has been developed.	Berman and Tettey 2001		x
	Rather than reforming the provision of public services, e-government based modernization projects are more likely to reproduce, in more complex ways, the long-established public-sector practices it sought to change.	Introna et al. 2010		x
	Agent of change internalise bureaucratic culture and practices and become agents of exploitation and corruption	Vaidya and Myers 2017		x
	Corruption in ICT4D project is aided by network of actors instead of just corrupt government officials	Sahay and Puri 2008		x
	Local individuals attempted at first to adhere to the 'western' ways of working that brought positive transformations. However, when the overseas team members returned to the USA, the locals fell back to their old ways and practices [...] transformations and improvements were not entirely adapted and embedded within the local practices.	Choudrie et al. 2017		x

	Technology comes across as both partial and mistargeted: partial, because it only targets the ration dealers and not the other actors in the supply chain, and mistargeted, as it addresses the effect of the problem and not its root cause.	Masiero 2015		x
	Digitalization did not lead to radical transformation as in Singapore. Rather, new practices mixed with old corrupt ones	Addo 2016		x
	Subversion of technology and controls	Heeks 1998, Davis 2004		x
				x
	Low e-readiness, lack of infrastructural development, skills and a digital divide hamper potential of technology in fight against corruption	Bhuiyan 2011		x
	Radio call-in programmes do not simply offer a new platform for citizens to challenge those who are governing but that they are also spaces where existing power structures reproduce themselves in new forms	Stremlau et al. 2015		x
	System does not fully succeed in its transparency objectives	Martinez 2015		x
Digitalisation removed some avenues for corruption, thereby reduced corruption		Senyo et al 2019, Amankwah-Safo et al 2018	x	
Computerization initiatives that reduce uncertainty and asset specificity of government services lead to lowered perceptions of corruption.		Prasad and Shivaraj an 2015	x	
OPEN system in Korea appears to have had impressive reform and anti-corruption success through transparency and accountability mechanisms; and also because of its successful design and implementation		Cho and Choi 2004	x	
Lowered information asymmetry and corruption through e-government services		Silal et al 2019	x	
When OPEN was introduced in 1999, the anti-corruption index of the SMG was 64.0. It increased to 84.9 in 2006, indicating a steady improvement in transparency		Kim et al. 2009	x	
Service-delivery oriented IT initiatives contribute to an effective, multi-pronged strategy to cut corruption in the Fiji public sector.		Pathak et al. 2009	x	
Application of EMS had a positive effect on reducing corruption. IT thus has the potential to reduce corruption, but the institution and the people are more important.		Xinli 2015	x	
Over the long-term digitalization helped reduce corruption and improved business processes		Addo 2018	x	
Perceived risk of corruption in manual procurement processes along with perceived usefulness of e-Procurement in combating corruption motivated adoption of the electronic government procurement system.		Nugroho 2014	x	
E-procurement technologies have potential to enable corruption control through several mechanisms		Neupane, Soar, and Vaidya 2015	x	
Digitalization improved population surveillance and civil registration processes and reduction in corruption such as falsification of ID cards		Ramasoota 1998	x	
ICTs (specifically e-Government) facilitate transparency and accountability, and limit corruption. Public institutions and their non-digital procedures also play a significant role in promoting transparent practices.		Corojan and Criado 2012	x	
Digitalization helped reduce information asymmetry through online presence		Goundar 2009	x	
ICT had a positive impact on the governance of provincial governments in China. ICT had two different effects on corruption: ICT helped corruption cases come to light and ultimately helped reduce corruption		Lee and Lio 2016	x	
Digitalization helps reduce information asymmetry and provides better understanding of government processes	The threshold in democratic developing countries to use ICT to unseat powerful groups is not close because citizens do not believe it is worth the effort to	Twinomurinzi et al 2011	x	x

	fight corruption, and for fear of victimization			
Internet offered voice to citizen's to demand for accountability, leading to corruption reduction		Kock and Gaskins 2013	x	
Digitalization helped reduce corruption by disrupting parasitic relationships		Syed et al 2019	x	
Digitalization helped reduce corruption and fraud		Owusu-Oware et al 2018	x	
ICT was used to reduce corruption and create a more "Weberian" bureaucracy but with clear limits		Veeraraghan 2013	x	

Table 11: Effects of digitalization on corruption in developing countries

Positive effects

So far in the literature on digitalization and corruption there are no examples of positive unintended effects i.e., where technology users enact strategic capabilities of technology in ways that disrupt their corrupt practices beyond the expectations and objectives of technology implementers. Often, the interests of technology implementers (government officials, donors, senior managers etc.) are depicted as diametrically opposed to those of corrupt technology users. Intended positive effects also appear to be highly contingent and not common. They include reductions in government administration dysfunctions such as red tape that is associated with corrupt practices like 'speed money', the strengthening of formal processes to reduce shady practices (Senyo et al., 2019b; Veeraraghavan, 2013), constraining of corrupt behaviours by increasing transparency (Corojan & Criado, 2012; Twinomurinzi, 2011), and disruption of corrupt practices and constituent networks (Syed & Bandara, 2019). As most reported positive effects of digitalisation were intended or expected, future studies might yield interesting insights by exploring unintended effects of digitalization and how these manifest.

While there was insufficient evidence to assess the time range over which digitalization was considered, it is conceivable that short-term and longer-term observations might reveal differing effects (fewer positive effects in the short-term and more in the longer-term as digital technologies become more institutionalized and their benefits accumulate) (Addo, 2017).

Negative effects

Converse to our findings on positive effects, there are no examples of intended negative effects. Recorded negative effects involve the shifting of old forms of corruption to other areas or forms or the creation of new forms of corruption through digital technologies (Heeks, 1998). Corrupt actors might also follow designed processes in the short-run but relapse to old ways once monitoring is loosened or consultants leave the scene (Choudrie et al., 2017). Negative unintended effects of digitalization on corruption include emergence of new forms of virtual corruption (Addo & Senyo, 2020), political wrangling and power struggles (Silva & Hirschheim, 2007), victimization (Twinomurinzi, 2011), and mistargeting of root cause of corruption (Masiero, 2015; Masiero & Prakash, 2015).

Though the literature points to unintended negative effects of digitalisation for anti-corruption, there is limited knowledge on the intended (expected) effects and how these are prepared for. Given that awareness of potential negative effects is critical in digitalization project risk assessment and mitigation, it will be insightful to understand evidence of such manifestation. There is also insufficient evidence on the time dimension of anti-corruption digitalisation. Thus, there are still unanswered questions that require research attention about the unfolding over time of both the positive and negative effects of anti-corruption digitalization in developing countries.

4. Agenda for Research

Having traced the contours of the extant research on digitalization and government corruption in developing countries and highlighted outstanding issues, we proceed to outline a four-point agenda to extend the theoretical and empirical contributions in this area. To continue developing relevant insights for research and practice we suggest (1) clarifying links between anti-corruption strategies and digitalization (2) explicating how government corruption materializes and interacts with modalities of digitalization (3) uncovering digitalization-enabled capabilities and dynamic capabilities in the fight against corruption and (4) embracing

methodological diversity to shed light on long-term processes, local perspectives and worldviews underpinning corruption and digitalization, as well as to bridge quantitative and qualitative work to provide novel approaches and empirics.

4.1 Clarifying links between anti-corruption strategies and digitalization

The literature on strategy has shown the relevance of having an IS strategy that is aligned with an overall organizational strategy (Karpovsky & Galliers, 2015; Newkirk, Lederer, & Johnson, 2008). While much of this work applies in business organizational contexts the merits of the alignment arguments are no less true for the public sector (Boudry & Verdegem, 2012; Kim, Pan, & Pan, 2007; Meijer & Thaens, 2010). In the case of strategic digital technologies deployed in the fight against corruption, clear anti-corruption intentionality rendered through coherent strategies have been shown through the Singapore case to be essential. Nonetheless, not much is known about this aspect of digitalization and government corruption in developing countries, the range of strategies in use, their underlying conceptualizations, hypothesis of digitalization, motivating norms and values, or linkages to broader e-government strategies across the public sector as was the case in Singapore.

The process of anti-corruption strategy formulation also needs to be elucidated and the black box opened to reveal actors, interest and processes shaping such. In the developing country context where corruption is endemic this is especially important because the often-made assumption based on a principal-agent framing of corruption—that senior management/ government officials/citizens (who act as principals) are corruption-free and interested in curbing the opportunism of street-level bureaucrats (the agents)—does not necessarily apply. Principals may publicly or formally proffer an anti-corruption stance while acting (or not acting) to promote corruption privately and informally within networks that include corrupt agents.

Finally, the dynamism of strategizing and aligning in practice needs to be explored in relation to digitalization and the feedback from the environment and anti-corruption effects. Given that corrupt actors are quick to learn and adapt to anti-corruption interventions, strategizing becomes akin to building a mouse trap, where constantly improving approaches are needed to outwit intelligent, constantly improving mice.

4.2 Explicating materialization of government corruption and anti-corruption digitalization modalities

Overall, the empirical base and theorizing on the topic of digitalization and government corruption in developing countries needs further development, greater conceptual clarity and better specification. More and different empirical studies (beyond the typical case studies or observational studies) of specific corruption practices in government organizations- their material configuration, actors, rationales and interactions with specific digitalization modalities of change (mechanisms) are needed to support novel middle-range theorizations. Such studies might benefit further from contextualist approaches that privilege the specificity of the developing country national and organizational contexts in shaping digitalization and corruption phenomena.

Organizationally, the mutual interactions between strategic capabilities of digital technologies/modalities of anti-corruption and their formative organizational structures require further exploration to better understand the potential of digitalization for deep structure changes that might render longer term transformation of corrupt practices (Addo, 2017; Silva & Hirschheim, 2007). Similarly, better understanding of the mutual interactions between strategic capabilities of digital technologies and organizational barriers might inform actions to improve institutionalization of technologies in established practices and to overcome opposition to improvements.

Regarding the broader context of developing countries, the literature on digitalization and corruption might usefully draw from other disciplines such as political economy and ethnography where the national context of developing countries in relation to corruption has been well-studied from historical and situated approaches to explain commonalities that underpin observations of the endemic nature of corruption and its endurance.

4.3 Uncovering digitalization enabled capabilities and dynamic capabilities in the fight against corruption

The literature suggests that anti-corruption interventions involving digitalization are different from normal strategic implementations because corruption cannot be directly observed and corrupt actors are quick to learn, adapt to, or sabotage interventions. This point begs the question of what specific capabilities and dynamic capabilities within government organizations are needed in the fight against corruption and what the role of digitalization is in enabling these. Though the literature provides anecdotal evidence of enhanced capabilities of digital technology to curb corruption, a number of questions remain unanswered that future studies may explore.

First, it is still unclear how dynamic capabilities of digital technologies are built and sustained to fight government corruption. For organisational survival, there is a requirement to build and maintain a host of dynamics (Schilke, Hu, & Helfat, 2018). Moreover, corruption itself is a potent threat to organisational survival. Notwithstanding the contribution from prior IS studies, there is little knowledge within the government corruption literature on how digital dynamic capabilities are built and maintained in corruption contexts.

Second, there is limited understanding of how best digital technologies can be configured, integrated and implemented to curb government corruption. Given that corrupt actors find innovative ways to perpetuate corruption virtually in light of digitalization, is it important to understanding dynamic sociotechnical processes linked to capabilities of digital

technologies. However, questions remain about how to identify, source and combine appropriate technology capabilities.

Lastly, there is an avenue for future research to explicate how context and cultural characteristics affect dynamic capabilities. Developing countries are characterised by sociocultural idiosyncrasies that are sometimes neglected in digitalisation projects (Al-Hujran, Al-dalahmeh, & Aloudat, 2011; Ali, Weerakkody, & El-Haddadeh, 2009). Though the extant literature has pointed out the effect of context in general (Avgerou, 2017; Avgerou & Madon, 2004), there is limited understanding of how context and culture affects the identification, sourcing, development, and maintenance of digitally enabled dynamic capabilities in fighting corruption.

4.4 Embracing methodological diversity

The literature points to a dominance of observational and case studies based on variance accounts. Although these have some merits they are limited in not sufficiently unpacking interactions between digitalization and corruption as well as their unfolding processes over time. Given that public sector reforms generally take a long time to unfold (Chang, 2001; Schacter, 2000), variance-based case studies might be focusing on barely-noticeable moment-in-time changes rather than noticeable longer term effects. Importantly, the central question of how corruption displaces after digitalization might be fruitfully explored with systematic studies of changes over time and at various levels of analysis—within work routines, processes, practices, work systems and entire organizations.

Corruption has also tended to be framed through western ethical and organizational lenses but more needs to be understood about the motivations of corrupt government actors and citizens in relation to the broader context of developing countries. Ethnographic approaches, such as individual, team and state ethnographies have potential to yield insights that can improve understandings of the normalization forces of corruption and the basis for

their embeddedness in society even as socioeconomic conditions improve (Cantens, 2013; Cantens, Raballand, & Bilangna, 2012; Chalfin, 2008; Street, 2012).

Finally, the evidence of positive anti-corruption effects of technology that is revealed in the observational studies literature (Shim & Eom, 2008, 2009; Srivastava et al., 2016) must be reconciled with the overwhelming evidence of failed anti-corruption interventions suggested by in-depth case studies (Davis, 2004; Heeks, 1998; Masiero, 2015; Masiero & Prakash, 2015; Silva & Hirschheim, 2007). Such bridging of quantitative and qualitative studies might throw up novel approaches and evidence sources to explore wicked aspects of corruption such as its displacement and persistence.

5. Limitations

Although we have approached our study systematically, we have only focused on the debate from an IS (and sociotechnical) perspective. The topic is relevant in other disciplines and fields of study where it is framed and studied differently. For example, we have not considered a rich and growing body of work in Economics that makes different assumptions about the nature of digital technologies and employs a range of quantitative approaches or experimental methodologies such as randomized control trials (RCT) to explore corruption and anti-corruption determinants (e.g. the work of MIT's J-PAL program). Our findings and suggestions are therefore not generalizable beyond a defined scope of IS and related debates.

Second, we adopt a basic strategic perspective on digital technology as a starting point given that most anti-corruption interventions involve strategic information systems or some degree of strategic intent. Nonetheless, in view of our goal to synthesise the research and paint a coherent picture, we have had to trade off depth and breadth e.g. in terms of the level of detail in aspects of our analysis such as the strategic implications of digital technologies in the government administration of developing countries. Some of this work has been covered more

richly elsewhere (Rabaiah & Vandijck, 2009; Weerakkody, Janssen, & Dwivedi, 2011; Xenakis & Macintosh, 2005).

Third, while we made effort to exhaust the IS literature related to digitalization and corruption (by searching across the body of recognized IS journals and conferences), there were more publications that covered the topic outside the mainstream IS journals than within it. As such we were unable to trace the level of theoretical development/accumulation on the topic within IS as there were not many IS-specific studies in conversation with each other. Future studies might for instance conduct a meta-analysis of IS studies to assess the development of theory.

6. Conclusions

Our review of the IS and related research on digitalization and government corruption in developing countries points to a diverse and instructive body of work that is generally in need of further empirical and theoretical development. Given the multifaced and complex nature of government corruption, no single disciplinary approach or framing holds the key to unlocking the potential of digitalization for anti-corruption. Rather, multidisciplinary perspectives informed by sound and accumulated empirical evidence might have better chances of improving understanding on the topic.

As digital technologies continue to evolve, it is pertinent to continue exploring how their deployment and application might expand the range of possibilities for anti-corruption interventions in developing countries. More recent technologies like blockchain have been suggested to enable trust-free transactions without human or institutional intermediaries (Beck, Stenum Czepluch, Lollike, & Malone, 2016). Possibilities of these and other technologies like artificial intelligence (AI) and social media might have significant developmental and anti-corruption potential, although not in isolation. We believe our suggested agenda might help

improve theoretical and practical capacity to effectively realize the potential of digital technologies in the fight against government corruption in developing countries.

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Appendices

Appendix 1: Details of research method

Our grounded theory literature review approach comprised five stages and associated tasks (Table A1). In the subsections below, we outline how each stage was carried out.

Table A1: Grounded theory literature review approach

Stages	Task(s)
1. Definition of review scope	• Perform initial search to understand the literature coverage • Define inclusion/exclusion criteria • Identify sources • Identify fields of research • Establish search terms
2. Literature Search	• Perform the main search
3. Literature Selection	• Apply the inclusion/exclusion criteria and identify additional sources to produce the final sample • Refine the sample
4. Analysis of corpus	• Apply grounded theory coding techniques (open, axial and selective coding) to analyze each selected article
5. Presentation of findings	• Define structures to represent findings (e.g., tables, graphs) • Define the structure of the review itself • Write up the review

Stage 1: Definition of review scope

In this first stage, we defined the scope of the review by setting our boundaries. Our criteria was defined to consider only peer-reviewed journals and reputable conferences as these sources cover high-quality contributions on the topic (Webster & Watson, 2002). We excluded dissertations, book reviews, books, as well as sources without full text and not in English.

In defining the scope of the review, we also performed an initial search in four databases, namely AIS Library, Scopus, Web of Science and Google Scholar so that we could understand coverage of literature and various conceptualisation of digitalization and corruption in relevant disciplines. These databases were selected because they host majority of IS and management journals and conferences. AIS library hosts leading IS journals and conferences while Scopus and Web of Science covers a significant range of peer-reviewed management journals. The findings from initial search show that our phenomenon of interest, "digitalization and corruption" transcends IS and other management disciplines. Therefore, we defined our scope to cover IS, Public Administration, Development and ICT4D, and General Management disciplines.

Our initial search also showed that different concepts such as "ICT", "information technology", "information systems" and "technology" have been used to investigate digitalization and corruption. Therefore, we defined our search terms to include different

variations and combination of these keywords containing the terms “digitalization”, “ICT”, “information and communication technology”, “information system”, “information technology”, “technology”, “developing country” [as well as full list of named countries in that grouping as determined by the World Bank] and “corruption”. Full list of search terms and dates are available from the authors.

Stage 2: Literature search

At this stage, we conducted the main literature search in the four databases based on the defined search protocol and keywords. We iteratively searched each of the four databases individually (our last search took place on 12th December 2019). Our search was aided by the advanced search features in the selected databases. The searches were performed on the titles, abstracts and keywords to ensure only relevant article were retrieved. Given that the selected databases have difference search features, we had to adjust some of our search queries. For instance, in searching AIS Library (Figure A1), we only used the search term “corruption” on the title, abstract and subject (keyword) since this is an IS database that host studies related to digitalization. From the search results, we manually review the title and abstracts of each article and download the PDF and record any metadata such as authors details, title of publication, year and abstract in an Excel spreadsheet. These details are recorded to avoid duplication and ensure data integrity.

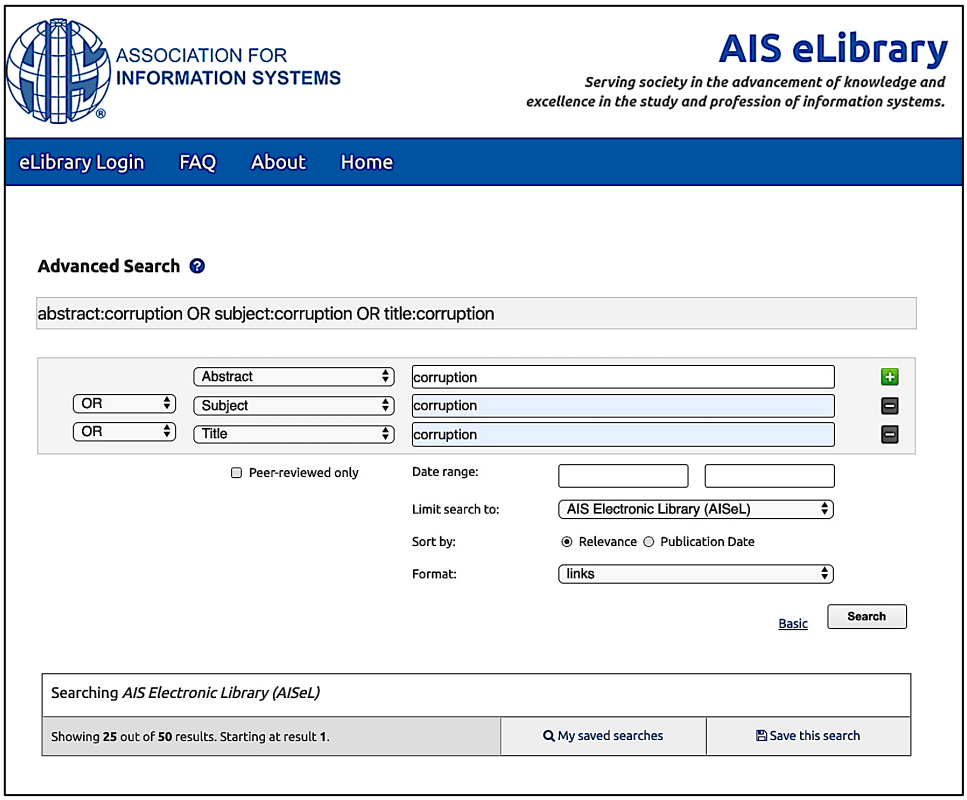

Figure A1: Literature search in AIS Library

Stage 3: Literature selection

During this stage, we reviewed the literature corpus to select articles that are useful for the review. From an initial hit of 2,794 articles matching common keywords associated with digitalization, information technology, government, corruption, and developing countries, we manually reviewed each article based on our inclusion and exclusion criteria. For instance, we removed some articles that only used corruption as an example without discussion it into detail in the main article. Similarly, were also discarded articles that listed corruption as a keyword without further discussion in the main text. After applying our inclusion and exclusion criteria, we ended with 81 number of articles deemed useful for our review. We then performed forward and backword searches on the selected articles to ensure we do not unintentionally miss any useful article. This process resulting in additional 8 articles. Lastly, we for duplicates in the selected articles since searched multiple databases that index the same articles. After iteratively filtering and selecting appropriate articles for our review, we ended up with a final corpus of 90 highly relevant empirical studies.

Stage 4: Analysis of corpus

At this stage, we performed two main analysis. First, we performed descriptive analysis based on codes extracted from each article on elements, namely article title, author(s), publication outlet, publication year, publication outlet type (e.g., journal or conference proceedings), context of study (i.e. country of study), level of analysis (e.g., country, organization, group/team, department or individual), theoretical foundation, research method, research approach, as well as definition of government corruption and associated conceptual issues if any. The result of this analysis is presented in Appendix 2.

Second, we performed a more detailed analysis based on grounded theory techniques of open, axial and selective coding (Wolfswinkel et al., 2013). During this analysis, we thoroughly read each article in our corpus and developed open codes on the issues, focus, findings, discussion as well as other important elements in the first instance. For instance, open codes were extracted on the *expectation of digitalization in anti-corruption, nature of anti-corruption strategy, expected outcomes of digitalization and if outcomes were intended as well as digitalization processes (pre-implementation/post-implementation) among others*. In line with tenets of grounded theory, we iteratively coded elements from each article to gradually discover salient excerpts that are useful to our review (Corbin & Strauss, 1990).

Following this, we analysed the conceptual similarity of the open codes to generate axial codes by iteratively mapping and integrating the code excerpts. For instance, open codes such as “IT lowers transaction costs which reduces corruption” and “IT enables improved

business processes which leads to reduction in corruption" on the expectation of digitalization technology effects on corruption in developing countries were integrated to generate an axial code labelled "Connectivity". In line with the grounded theory coding and analysis technique, we performed several iterations between the open codes, articles corpus and the axial codes.

Lastly, we performed selective coding by iteratively analysing and refining the axial codes (Corbin & Strauss, 1990). The selective coding process led us to generated high-order codes that formed the foundation for the framework of digitalization and government corruption in developing countries. Given that the selective codes only present issues at a high-level, we ensure that our framework captures lower-level open and axial codes to present a clearer understanding of the relationships between key concepts underpinning our review.

Stage 5: Presentation of Findings

In this last stage, we presented the findings from the review in the main article and in Appendices 2 and 3. The findings were presented in the main article under three major headings: (1) defining government corruption, (2) expectation of digitalisation in anti-corruption and (3) framework of digitalization and government corruption in developing countries. The findings presented in Appendix 2 cover descriptive statistics such as publication outlet, level of analysis, publication year, publication outlet type, context of study, level of analysis, theoretical foundation, and research methods on selected article in our corpus. Lastly, Appendix 3 presents the full list of articles used in our review.

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Appendix 2 – Descriptive Statistics of Studies on Digitalization and Government Corruption in Developing Countries

This appendix presents descriptive statistics on articles reviewed in this study. As presented in Figure A2.1, studies on digitalisation and government corruption transcend micro, meso and macro levels. However, the majority of studies are at the macro cross-country level (n=38), followed by national (n=25) and organisational (n=15) levels. The dominance of cross-country studies is attributed to the frequent use of corruption perception index secondary data in majority of articles.

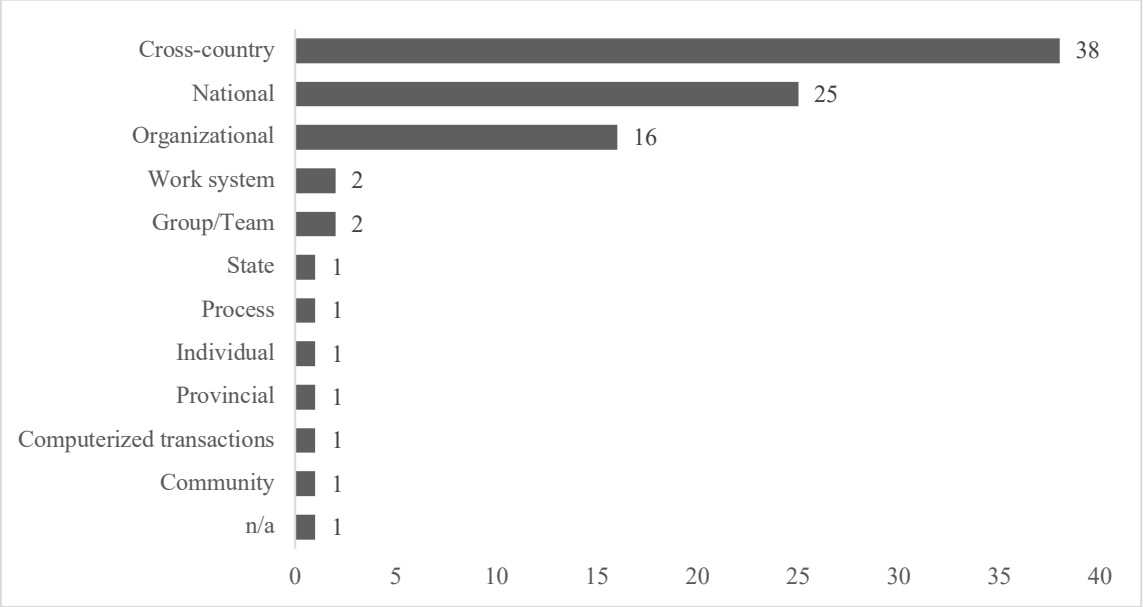

Figure A2.1: Level of analysis of the literature review

Figure A2.2 presents distribution of studies reviewed in terms of primary research themes.

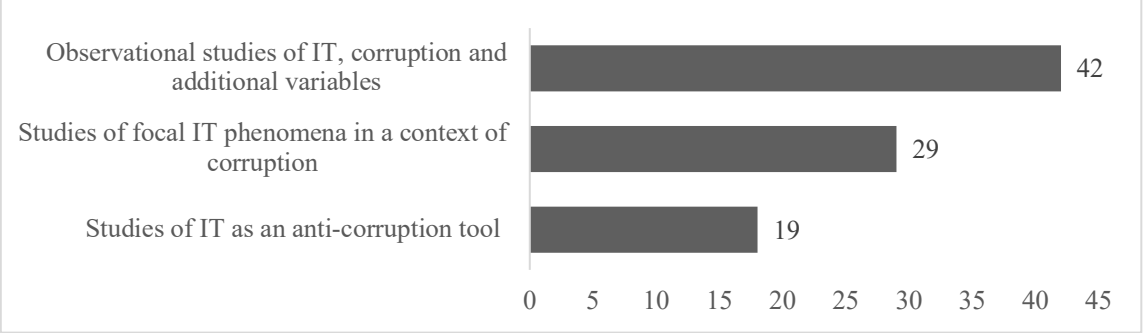

Figure A2.2: Primary research themes of the literature review

Majority of articles belong to the observational studies of IT (n=42) which considered corruption at the national or cross-country level with less specificity on the range of corruption types at stake or their materialization in specific settings. This theme is followed by studies of focal IT phenomena in a context of corruption (n=29) which investigated corruption at the

organisational, national, group/team, transactions, individual, state and process levels. Lastly, articles in the studies of IT as an anti-corruption tool theme (n=19) considered individuals and their practices, corruption within group and teams, corruption at the level of work process, within particular government administrations/agencies, across government administrations/agencies or at the societal level.

In terms of research methodologies used in the articles reviewed, the findings as presented in Figure A2.3 show that majority of studies used the quantitative methodology (n=48), followed by the qualitative (n=24), conceptual studies (n=13) and mixed method (n=2) and design research (n=2). Given that majority of the studies reviewed used secondary data for cross-country analysis, this result was not surprising. However, to ensure a holistic understanding of digitalisation and government corruption, there is a need for more qualitative, mixed methods and design studies.

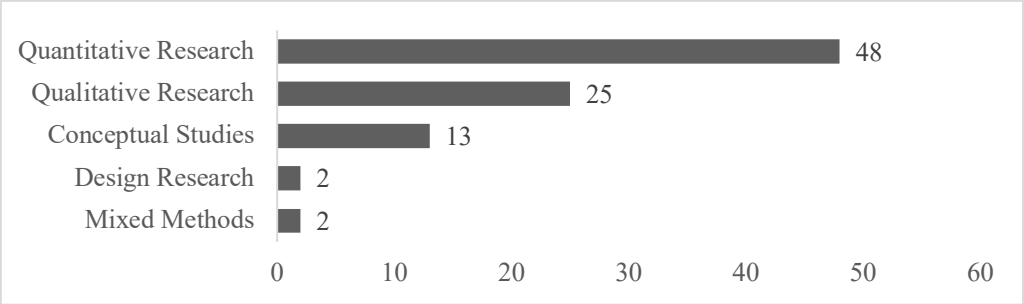

Figure A2.3: Research methodologies used in the literature review

The review shows mixed trends with regards to yearly distribution of articles (see Figure A2.4). Though studies on digitalisation and government corruption within our areas of focus were published from the year 1998 (n=2) to 2019 (n=3), some years (1999,2000, 2001, 2002, 2003, 2006) witnessed no publications. On the other hand, the years 2017 (n=10), 2015 (n=9) and 2014 (n=9) witnessed more studies. Though the overall number of studies on digitalization and government corruption is notable, there is need for more research given the strategic nature of this area.

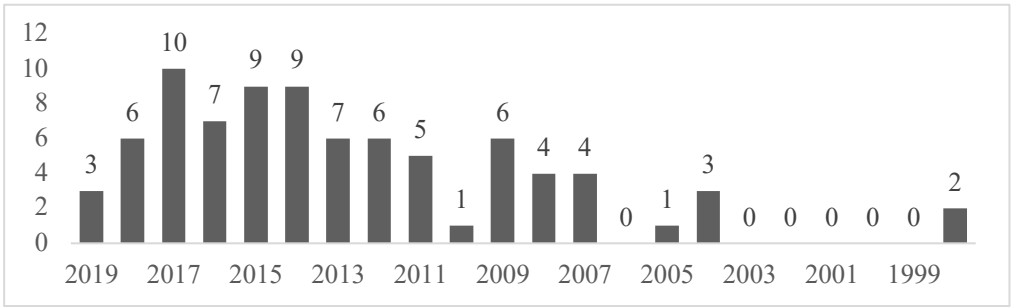

Figure A2.4: Yearly distribution of literature review

Appendix 3 – List of studies reviewed

Study	Publication	Paper title
Journal Articles		
Abu-Shanab et al. 2013	International Journal of Electronic Governance	E-government as an anti-corruption tool: citizens perception
Addo 2016	Electronic Journal of Information Systems in Developing Countries	Explaining 'irrationalities' of it-enabled change in a developing country bureaucracy: The case of Ghana's TradeNet
Ameen and Ahmad 2013	Journal of Theoretical and Applied Information Technology	A Framework of Financial Information Systems to Reduce Corruption
Andersen 2009	Information Economics and Policy	E-Government as an anti-corruption strategy
Bailard 2009	Political Communication	Mobile Phone Diffusion and Corruption in Africa
Berman and Tettey 2001	Public Administration & Development	African states, bureaucratic culture and computer fixes
Bhattacherjee and Shrivastava 2018	Government Information Quarterly	The effects of ICT use and ICT Laws on corruption: A general deterrence Theory perspective
Bhuiyan 2011	Government Information Quarterly	Modernizing Bangladesh public administration through e-governance: Benefits and challenges
Charoensukmongkol and Moqbel 2014	Public Organization Review	Does Investment in ICT Curb or Create More Corruption? A Cross-Country Analysis
Cho and Choi 2004	International Journal of Public Administration	E-Government to Combat Corruption: The Case of Seoul Metropolitan Government
Choi 2014	World Political Science Review	E-Government and Corruption: A Cross-Country Survey
Choudrie et al. 2017	Government Information Quarterly	Implementing E-government in Lagos State: Understanding the impact of cultural perceptions and working practices
Davis 2004	World Development	Corruption in Public Service Delivery: Experience from South Asia's Water and Sanitation Sector
DiRienzo et al. 2007	Journal of International Business Studies	Corruption and the role of information
Elbahnasawy 2014	World Development	E-Government, Internet Adoption, and Corruption: An Empirical Investigation
Garcia-Murillo 2013	Information Technology for Development	Does a government web presence reduce perceptions of corruption?
Heeks 1998	Information Technology and Public Sector Corruption	Information Technology and Public Sector Corruption
Introna et al. 2010	International Journal of Public Administration	The Working Out of Modernization in the Public Sector: The Case of an E-government Initiative in Greece
Jha and Sarangi 2017	Information Economics and Policy	Does social media reduce corruption?
Kanyam et al. 2017	World Development	The Mobile Phone Revolution: Have Mobile Phones and the Internet Reduced Corruption in Sub-Saharan Africa?
Kim 2014	Public Organization Review	Anti-Corruption Initiatives and E-Government: A Cross-National Study
Kim et al. 2009	Government Information Quarterly	An institutional analysis of an e-government system for anti-corruption: The case of OPEN
Kock and Gaskins 2014	Information Technology for Development	The Mediating Role of Voice and Accountability in the Relationship Between Internet Diffusion and Government Corruption in Latin America and Sub-Saharan Africa
Kossow and Kukutschka 2017	Crime, Law, and Social Change	Civil society and online connectivity: controlling corruption on the net?
Kovacic 2005	International Journal of Electronic Governance	A Brave New E-World? An Exploratory Analysis of Worldwide E-Government Readiness, Level of Democracy, Corruption and Globalization
Krishnan et al. 2013	Information and Management	Examining the relationships among e-government maturity, corruption, economic prosperity and environmental degradation: A cross-country analysis

Lee and Lio 2016	Information Development	The impact of information and communication technology on public governance and corruption in China
Lio et al. 2011	Government Information Quarterly	Can the internet reduce corruption? A cross-country study based on dynamic panel data models
Mahmood 2004	Perspectives on Global Development and Technology	Can Information and Communication Technology Help Reduce Corruption? How So and Why Not: Two Case Studies from South Asia
Masiero 2015	World Development	Redesigning the Indian Food Security System through E-Governance: The Case of Kerala
Mistry 2012	Accounting and the Public Interest	The Role of e-Governance in Mitigating Corruption
Mistry and Jalal 2012	The International Journal of Digital Accounting Research	An Empirical Analysis of the Relationship between e-government and Corruption
Nam 2018	Government Information Quarterly	Examining the anti-corruption effect of e-government and the moderating effect of national culture: A cross-country study
Neupane et al. 2012	Electronic Journal of Information Systems in Developing Countries	Evaluating the anti-corruption capabilities of public e-procurement in a developing country
Neupane, Soar, and Vaidya 2014	Australasian Journal of Information Systems	Evaluating the anti-corruption capabilities of public e-procurement in a developing country
Neupane, Soar, and Vaidya 2015	Business Law and Ethics: Concepts, Methodologies, Tools, and Applications	Anti-Corruption Capabilities of Public E-Procurement Technologies: Principal-Agent Theory
Oni 2016	Design Solutions for User-Centric Information Systems	E-Government adoption in Nigeria and the Journey So Far: The End of Corruption?
Pathak et al. 2009	International Journal of Public Administration	E-Governance to Cut Corruption in Public Service Delivery: A Case Study of Fiji
Peterson 1998	Public Administration & Development	Saints, demons, wizards and systems: why information technology reforms fail or underperform in public bureaucracies in Africa
Prasad and Shivarajan 2015	Journal of Public Affairs	Understanding the role of technology in reducing corruption: a transaction cost approach
Ramasoota 1998	Information Technology for Development	Information technology and bureaucratic surveillance
Relly 2012	Government Information Quarterly	Examining a model of vertical accountability: A cross-national study of the influence of information access on the control of corruption
Sassi and Ben Ali 2017	Telecommunications Policy	Corruption in Africa: What role does ICT diffusion play
Saxena 2017	Foresight	Factors influencing perceptions on corruption in public service delivery via e-government platform
Shim and Eom 2008	International Journal of Public Administration	E-Government and Anti-Corruption: Empirical Analysis of International Data
Shim and Eom 2009	International Review of Administrative Sciences	Anticorruption effects of information communication and technology (ICT) and social capital
Silva and Hirschheim 2007	MIS Quarterly	Fighting against windmills: Strategic information systems and organizational deep structures
Srivastava et al. 2016	MIS Quarterly	You Can't bribe a computer: Dealing with the societal challenge of corruption through ICT
Stamati et al. 2015	Government Information Quarterly	Social media for openness and accountability in the public sector: Cases in the Greek context
Stremlau et al. 2015	Third World Quarterly	Patronage, politics and performance: radio call-in programmes and the myth of accountability
Valle-Cruz et al. 2016	Information Polity	Citizens' perceptions of the impact of information technology use on transparency, efficiency and corruption in local governments
Xinli 2015	Electronic Library	Effectiveness of information technology in reducing corruption in China: A validation of the DeLone and McLean information systems success model
Zhao and Xu 2015	International Journal of Public Administration	E-Government and Corruption: A Longitudinal Analysis of Countries
Conferences Articles		
Addo 2018	International Conference on Information Systems	Controlling Government Corruption through IT: An Opportunity Theory Perspective

Alryalat at al 2013	UK Academy for Information Systems	EXAMINING ROLE OF USEFULNESS, EASE OF USE AND SOCIAL INFLUENCE ON JORDANIAN CITIZEN'S INTENTION TO ADOPT E-GOVERNMENT
Amankwah-Safo et al 2018	Americas Conference on Information Systems	Import Clearance Digitalization and Socioeconomic Development: A Case Study of Ghana
Bellini 2014	Mediterranean Conference on Information Systems	Big Data Analytics for Financial Frauds Detection
Goundar 2009	GlobDev	An Evaluation of Fiji's E-Government Status: Assessed According to UN Report on Benchmarking E-Government Progress
Hope and Korpoe 2011	Americas Conference on Information Systems	The Effects of ICT Pervasiveness on Administrative Corruption
Khan and Krishnan 2018	Pacific Asia Conference on Information Systems	Corruption in National Institutions and E- Government Maturity: Insights from Cross- Country Data
Kock and Gaskins 2013	Americas Conference on Information Systems	Internet Diffusion and Government Corruption in Latin America and Sub-Saharan Africa
Krishnan and Teo 2012	International Conference on Information Systems	Does Governance Matter? Investigating the Impact of Governance on e-Government Maturity
Krishnan et al 2012	Pacific Asia Conference on Information Systems	E-Government Maturity, Corruption, And Eco- Efficiency
Martinez 2015	2015 International Conference on Information Systems	Transparency in Brazil: Why Has it Failed to Curb Corruption?
Mimbi and Bankole 2016	ACM International Conference Proceeding Series	Factors Influencing ICT Service Efficiency in Curbing Corruption in Africa: A Bootstrap Approach
Nugroho 2014	Proceedings of the European Conference on e-Government, ECEG	Electronic Government Procurement Adoption in Developing Economies: How Corruption Influence System's Adoption
Owusu-Oware et al 2018	Americas Conference on Information Systems	Biometric Technology for Fighting Fraud in National Health Insurance: Ghana's Experience
Palvia et al 2017	Americas Conference on Information Systems	Imperatives and Challenges in using E- Government to Combat Corruption: A Systematic Review of Literature and a Holistic Model
Pankowska 2017	International Conference on Information Systems Development	Business Strategy Analytics for Public Procurement Architecture Development
Priyatman 2008	Pacific Asia Conference on Information Systems	Evaluating the Design and Implementation of e-Government in Southeast Asian Developing Countries using Actor Network Theory
Raghupathi and Wu 2011	Communications of the Association for Information Systems	The Relationship Between Information and Communication Technologies and Country Governance: An Exploratory Study
Rana et al 2013	UK Academy for Information Systems	Examining Factors Affecting Adoption of Online Public Grievance Redressal System: A Case of India
Rana et al 2014	UK Academy for Information Systems	Measuring Intention to use and Satisfaction with Electronic District System: Validation of a combined Model of IS Success
Sahay and Puri 2008	International Conference on Information Systems	The Dynamics of Corruption and ICT Projects: Case Study from the Public Health System in India
Selke et al. 2008	Proceedings of the European Conference on e-Government, ECEG	E-Honesty: Technical potentials and social risks of local e-government strategies in Bangladesh for supporting the fight against corruption
Senyo et al 2019	European Conference on Information Systems	Unpacking the role of Political-will in Digital Business Ecosystem Development for Socioeconomic Benefits
Seo and Warman 2011	International Conference on Information Systems	User Satisfaction of E-government Procurement Systems in Developing Countries: An Empirical Research in Indonesia
Shrivastava and Bhattacherjee 2014	Americas Conference on Information Systems, AMCIS 2014	ICT Development and Corruption: An Empirical Study
Shrivastava and Bhattacherjee 2015	Americas Conference on Information Systems, AMCIS 2015	ICT as a Corruption Deterrent: A Theoretical Perspective
Silal et al 2019	International Conference on Information Systems	From E-Government to Good Governance: The mediating role of Government E-Participation
Soper 2007	Americas Conference on Information Systems	ICT Investment Impacts on Future Levels of Democracy, Corruption, and E-Government Acceptance in Emerging Countries

Srivastava et al 2007	International Conference on Information Systems	E-Government and Corruption: A Cross-Country Analysis
Syed et al 2019	International Conference on Information Systems	Controlling Corruption in Developing Country Public Sector: A Process Eco-Systems Perspective
Therese and Azwe 2016	Americas Conference on Information Systems	Youth Policy and the Future of Africa's Development: Exploring the Potential Contribution of ICT in the Youth Empowerment Process in Cameroon
Twinomurinzi et al 2011	GlobDev	Corruption in African Democratic Developing Countries and ICT: Apathy, Anxiety and Patriotism
Vaidya and Myers 2017	International Conference on Information Systems	Power in ICT4D projects: The case of an Indian Agricultural Marketing Board
Veeraraghavan 2013	ICTD '13: Proceedings of the Sixth International Conference on Information and Communication Technologies and Development	Dealing with the digital panopticon: the use and subversion of ICT in an Indian bureaucracy
Walle at al 2018	European Conference on Digital Government	Fighting Administrative Corruption with Digital Government in Sub- Saharan Africa
Zhao et al. 2017	ACM International Conference Proceeding Series	E-government, corruption reduction and culture: a study based on panel data of 57 countries
Chapter		
Corojan and Criado 2012	Handbook of research on E-government in emerging economies: Adoption, E-participation, and legal frameworks	E-Government for Transparency, Anti-Corruption, and Accountability: Challenges and Opportunities for Central American Countries