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The Effects of ICT Pervasiveness on Administrative Corruption

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ABSTRACT

The problem of corruption has been universally acknowledged as a drain on a country's developmental efforts. Anticorruption reform hitherto has focused on political corruption. Administrative corruption which citizens have to contend with on a daily basis is only just beginning to attract attention. There have been various strategies, intensifying only recently, to stem the problem. Unfortunately in most of these countries corruption has remained stable or deteriorated. Our research characterized corruption as a contracting problem between citizens (principals) and the bureaucrats (agents). Using transaction cost economics we hypothesized that technology is necessary in dealing with the problem of coordination and transparency and ensuring arms-length relationships which reduces opportunities for corrupt behavior between the two groups of actors. We used a sample of 46 countries from a geographical region deemed to be battling the scourge of corruption as indicated by Transparency International's CPI rankings. The results of our model using partial least square modeling suggest that indeed Information and Communication pervasiveness in a country determines the level of corruption in a country. Technology achieves this by promoting transparency which is necessary in any anticorruption endeavor.

Keywords: corruption, arm's-length transactions, transaction cost economics, monopoly, accountability, transparency, intermediation

INTRODUCTION

Corruption is a huge public policy concern for development advocates globally. It is even more so for countries with high levels of poverty and low levels of literacy, high maternal and child morbidity and mortality rates and low life expectancies among others. A decade ago, UN recognized the urgency of reducing the unacceptable levels of global poverty by committing world leaders to the Millennium Development Goals (UN, 1990) which among a host of pledges promised to end poverty and increase access to universal primary education by 2015. Reported progress on these goals at the recent 2010 United Nations Summit, ten years later, is mixed. The UN estimates that progress has been made but

Korkpoe

ICT Pervasiveness on Administrative Corruption

much remains to be done especially in the developing world where one in six people still live in extreme poverty and more kids are out of the classroom.

This slow progress according to Transparency International's (TI) 2010 report "*The anti-corruption catalyst: realizing the MDGs by 2015*" is due to corruption. TI maintains that the prevalence of bribery, a form of corruption, has led to the seemingly less progress on increased access to education, improving maternal health and increasing access to clean water. In TI's view "anti-corruption and good governance mechanisms – like transparency, accountability and integrity – have a MDG payoff". TI recommends the full integration of anti-corruption efforts with the MDG goals for the five remaining years.

How does corruption impede progress at development as shown in the slow progress in achieving the MDGs? According to Kofi Annan, the former Secretary-General of UN, "Corruption hurts the poor disproportionately by diverting funds intended for development, undermining a government's ability to provide basic services, feeding inequality and injustice, and discouraging foreign investment and aid". The underlying theme in the above statement is institutional failure. Corruption undermines the credibility of the institutions of state which are supposed to provide public services to ordinary citizens. In so doing these institutions increase the burden on the poor thus obviating efforts of the central government to alleviate poverty. Corruption in and of itself act as a tax on the marginalized groups in society by increasing their transactional costs of accessing public services. These costs include legal charges, "speed money" and informational search cost. Public institutions with opaque or coded ways of operation worsen these and exclude a large swathe of the population from any stake in governance.

Institutional reform has received a lot of attention recently (Shepherd, 2003; Boylan, 1999). Khan (2003) links the failure of the "service delivery" state – providing law and order, stable property rights, key public goods and welfarist redistributions – to poor economic performance which in turn leads to governance failures like corruption and rent-seeking. In all these, the role of institutions is evident since they mediate service delivery between the state apparatus and the citizenry within the lower rungs of society. Fragile or dysfunctional state institutions are fertile grounds for corruption because of lack of accountability, transparency and stability in operational rules. Any attempts thus at rooting out administrative corruption should aim at, as part of the good governance agenda, strengthening these institutions first and foremost, increase transparency in their operations, promote accountability at all of its levels and make explicit the rules of engagement with citizens in public service delivery.

Rules in administrative service are important in as much as they provide certainty and clarity, the lack of which provides avenues for bureaucrats in rent extraction from ordinary citizens. Brennan and Buchanan (1985) posit that rules: (a) determine the nature of the interaction between individuals within society (b) constrain the behavior of individuals, as well as that of collectivities within the society (c) provide the means for the peaceful resolution of conflict and (d) provide information to market participants, enhancing the ability of each individual to anticipate the behavior of others. Mechanisms aimed at rooting out administrative corruption should have at its core the provisions of Brennan and Buchanan so that all participants are in the clear about what is required thus minimizing opportunistic behavior which is at the heart of corruption. The temptation of corruption according to Rose-Ackerman (1994) is strong whenever a public official has control over something valued by the public sector and discretion over who gets it lies with the public official. Klitgaard (1988) summarizes that in the relation he calls the “basic ingredients of corruption”:

$$\text{Corruption} = \text{Monopoly} + \text{Discretion} - \text{Accountability}.$$

It is possible to reduce corruption by using mechanisms that target the right side of the above relation. Using technology, we can reduce *Monopoly* and *Discretion* while increasing *Accountability*. Given the state of technological pervasiveness across the world and particularly the use of handheld devices in the developing countries, using technology has the potential to increase transparency in institutional dealings with the public, curb the monopoly enjoyed by bureaucrats, limit their discretionary power and make the system accountable. By so doing states would have removed a major obstacle to development, reach the poor with public services at a fraction or no cost and make huge savings that can be diverted into other equally pressing areas of the economy to enhance development outcomes.

The foregoing discussion using Klitgaard’s equation elicits two important research questions that this study seeks to address: (a) how does technology and its pervasiveness in a country enhance institutional integrity? (b) Does institutional integrity lead to a reduction in the level of corruption in a country?

In addressing these questions, I will draw on the extant literature in the characterization of corruption using both the principal-agent and collective action theories to expose the nature of the problem. I will then use arms-length principle which is within the framework of transaction cost economics to support the proposed model of the study.

LITERATURE REVIEW

Corruption, in spite of everything that is known about it, has remained intractable. It still grabs headlines across the world (Stefes, 2007). It has remained the focus of attention to the global push towards development (Tanzi, 1998). Starting in the 80s there have been numerous World Bank/IMF push towards economic reforms – principally a shift towards market

economies in the developing world. At the same time the world recognizes the debilitating effects corruption has on development (Mauro, 1996). Until the end of the cold war, the subject of political corruption was a touchy issue no one mentioned in order to keep friends.

The end of the cold war in the 90s and the détente that followed has redirected attention to the problem of underdevelopment and the squalid conditions under which many of the citizens of some parts of the world live. Ironically some of these worst conditions of human subsistence can be found in the most natural resource-rich countries of the world. Generations of leaders in these countries have looted their countries' wealth and stashed it abroad to the detriment of their citizens (Transparency, 1998).

Currently, the global fight against corruption is a big enterprise on its own. The efforts of Transparency International which started compiling data on perceptions of corruption across the world and ranking countries based on the perceived level of corruption using the yearly published *Corruption Perception Index* galvanized this effort and brought in other multinational organizations like the World Bank, International Monetary Fund, the United Nations, European Union among a host of others in the fight against corruption (Persson et al., 2010).

The anticorruption crusade hitherto has focused on political corruption. Countries perceived to be corrupt have been forced to democratize as conditions for development aid (c.f. MCA Contracts). Control of corruptions is now a key criterion for good governance (Apaza, 2007). Donors are also building mechanisms into development aid to ensure there is no corruption in their projects (Aguilar et al., 2000). With the launch of World Bank's Stolen Assets Recovery (STAR) Initiative (World Bank, 2007), much of the stolen wealth stashed abroad by corrupt leaders is being returned to their rightful places. Corrupt leaders are also being sanctioned globally through travel bans and blacklisting of companies and dealings with their families and dependents. All these efforts are meaningless to the ordinary citizens who have had to navigate the bureaucratic maze to access state services like getting a building permit, getting a driving license, securing a passport, etc. things people in other parts of the world take for granted. Deepening poverty even more, is the bribes citizens have to pay to corrupt bureaucrats to access health services, process school admissions for their wards and deal with executive excesses.

With the launch of the Millennium Developments Goals (MDGs, 2000), attention is now shifting to the eradication of systemic corruption especially administrative corruption which occurs at the interface of citizens and the bureaucracy.

Strategies adopted thus far have included institutional reforms and legislation. The scorecard however points to a failure of the anti-corruption interventions thus far (Global Corruption Report, 2009). The fragility of the anti-corruption institutions and crusaders and the lack of political will in the fight represent a worrisome prospect. By all indications, the resources committed so far have not even made a dent in fighting corruption. If anything, the incidence and perception of corruptions is escalating (Persson, 2010). This calls for another look at the strategies adopted currently in the fight.

Corruption evades a clear definition because of cultural underpinnings. What one would term as corrupt in the United States of America would be deemed as a gift in downtown Lagos in Nigeria. An elastic definition of corruption however stands the risk of making the fight against it difficult. For the purpose of this research, I am using the definitions as recognized by Transparency International and that of the World Bank.

Transparency International (1996) adopts an operational definition which sees corruption as “*the abuse of entrusted power for private gain*”. TI further staircases corruption into “according to rule” corruption and “against the rule” corruption. Instances of “according to rule” corruption include speed money to facilitate the provision of a service or services that is legally sanctioned. The latter, “against the rule” is where the receiver in the corrupt action pays to obtain a service or services he is legally barred from receiving.

The World Bank defines corruption rather succinctly as “*the abuse of public office for private gain*”. In these definitions, the presumption is that of asymmetries of power: the public official wields power by virtue of a position of trust and the other party possibly a citizen or any other private entity is subservient and therefore at the mercy of the public official.

Corruption manifests itself in many ways. The main form is bribery which citizens pay to bureaucrats or the bureaucrat demand via various means either overtly or covertly before public services are provided. Thus there is a demand-side and a supply-side to corruption. Where corruption is endemic or pervasive, public office holders demand bribes as a right or a routine before services are provided. On the other hand where corruption is isolated, citizens use bribes as a tool to influence the bureaucracy to bend the rules of engagement in the provision of public services.

The deleterious effects of corruption are well documented in the extant literature. According to Mauro (1997), corruption is a disincentive to businesses because it imposes additional costs of doing business. Thus corruption reduces investments and slows economic growth. Habiba and Zurawickib (2001) used empirical data from eleven countries over a five year period and they have been able to establish the negative impact of corruption on investments. In some parts of the world, corrupting public officials before one get to do business is a requirement. The United States government frowns on this

Korkpoe

ICT Pervasiveness on Administrative Corruption

and it enforces rigorously the Foreign Corruption Practices Act (FCPA 1997). In the first two months of 2010, the US government imposed fines totaling \$1.2 billion (Time Magazine April 2010).

Corruption exacts an inordinate toll on the poor by making a bad situation worse. Lerrick (2005) is emphatic that corruption is not just one of the causes of poverty but it is the root cause. Survey conducted in Kenya (Kenyan Urban Bribery Index, 2007) indicated that people in the low-income segment are more prone to paying bribes than those in higher income brackets. This has dire consequences for the poor. According to work by Gupta, Davoodi and Alonso-Terme (1998), a reduction in a country's corruption index on a scale of 0 to 10 is associated with a reduction in the average secondary schooling by 2.3 years. This entrenches poverty among the lower rungs of society as they are caught in the vicious cycle of poverty. Evidence is also provided by Jeffrey Sachs in his book *End of Poverty* that corruption and poverty are tightly correlated.

Corruption also leads to political instability especially in countries with not a long history of democratic governance. Military adventurists in Africa have always cited corrupt regimes as the reason for military take-overs (Ayittey, 1992). Pervasive corruption reduces the governance capacity of the state and in that situation the only coherent organized group has always been the military. Unfortunately the political history of the developing world is replete with instances of one military regime violently overthrowing the incumbent and citing the same reasons as corruption. When corruption becomes entrenched, the governing machinery loses legitimacy in the eyes of ordinary citizens and these citizens become the supporters of emergent unconstitutional regimes which promise to reverse the status quo.

Additionally corruption dissipates the resources of the state through misallocation (Acemoglu & Verdier, 2000). The donor community admits the lack of aid effectiveness in most developing countries due to the "leaky bowl syndrome" where millions of dollars of aid money from the developed world is re-routed to Swiss banks by the ruling elite. Additionally as a result of corruption, resources tend to be allocated not to the areas where there are productive and efficiency gains but where controlling public servants can extract the highest rent through bribery (Mauro, 1997). TI identifies corruption as being "*responsible for the funneling of scarce public resources to uneconomic high-profile projects, such as dams, power plants, pipelines and refineries, at the expense of less spectacular but fundamental infrastructure projects such as schools, hospitals and roads, or the supply of power and water to rural areas*". A more nuanced point is the waste of human resources in some developing countries. Highly trained professionals like physicians in some countries would rather prefer working for the Immigration or Customs Service. Coincidentally these are state institutions with low wages and do rank tops as the most corrupt in numerous institutional surveys.

According to Andrig and Fjeldstadt (2000), corruption can be seen as an exchange of favors between two actors – the agent and a client. In the context of this research work, the agent refers to the public servants or the bureaucracy which is the embodiment of the public interest entrusted and exercised for and on behalf of the citizens. In open democracies, the bureaucracy is in effect a group with delegated authority from elected rulers who are agents accountable to the citizens who wield ultimate power as agents. Thus the phenomenon of corruption is seen as an agency cost which characterizes principal-agent relationships (Rees, 1985). Agency costs arise out of information asymmetries between the principals and the agents and also unobserved actions of the principal (Stiglitz, 1987). Bureaucrats leverage these two situations – monopoly over information and unobserved actions to engage in corrupts acts of enriching themselves at the expense of the citizens. This principal-agent framework has characterized much of the anticorruption reform led by the World Bank. This has taken the form of altering the incentives of the agents to align the interests of the agents to that of the principals and also increase the potential opportunity costs for the agents. Policy implementations include the introduction of anti-corruption czars and institutions, including monitoring, increased transparency through sunshine laws, checks and balances, democratic election mechanisms, a free press, realistic wages for public officials, the strengthening of civil society groups and also strengthening the judicial systems of these countries (Stapenhurst & Kpundeh, 1999; Van Rijckeghem & Weder, 2001).

Another theory that perhaps that characterizes corruption better is *collective action theory*. The failure of the interventions posited within the principal-agent in practice means the absence of or the dereliction of the duty of the principals to hold the agents accountable. This would be the case if corruption is so pervasive that in fact there are no “principled” principals. In such societies thus you have all actors – principals and agents alike – caught in the quicksand of corruption. Corruption then turns to be the expected behavior. This is what Elinor Ostrom (1998) calls a second-order collective action dilemma. Neither the principals nor the agents hold the public interest but they all pursue a self-maximizing agenda.

If the collective action theory characterizes the phenomenon correctly, then the focus of current anti-corruption drives are doomed to fail foremost because being the only “honest” person in “Sodom and Gomorrah” has an inordinately high opportunity cost (della Porta and Vannucci, 1999). This is the situation that also arises in the game theoretical models (Macrae, 1982).

Game theoretic models and the principal-agent framework basically try to alter the incentives. This approach is however only effective in the context of the existence of strong and functioning legal-institutional structures. Technology intermediation efforts represent indirect approaches that are on the face of it a movement towards an information society

but in effect the underlying intention is to keep transactions at arms' length and eliminate potentially corrupting opportunities. Indeed for countries that have moved from totally corrupt systems to what is now acceptable, a head on approach has been avoided (Rothstein, 2010).

RESEARCH MODEL AND HYPOTHESIS

The yearly ranking of countries on the basis of the level of corruption reveals a relationship between the level of pervasiveness of Information and Communication Technology in the country and the position of the country on the list. In the latest CPI rankings (Transparency International 2010), the top twenty ranked countries which are in the developed world. Of these the top tier of countries with scores above 9 thus classified as "very clean" by Transparency International are in Scandinavia. Scandinavian countries are famous for their high level of technology penetration and uses. A ranking of countries based on the ICT Development Index (ITU, 2009) places these Scandinavian countries in the first ten.

The ICT Development Index is a composite index that incorporates a country's level of ICT infrastructure and access, ICT use by individuals, households and businesses and the intensity of use and ICT skills which measures the capacity necessary to use ICTs effectively.

ITU's schematic diagram is shown in Fig. 1.

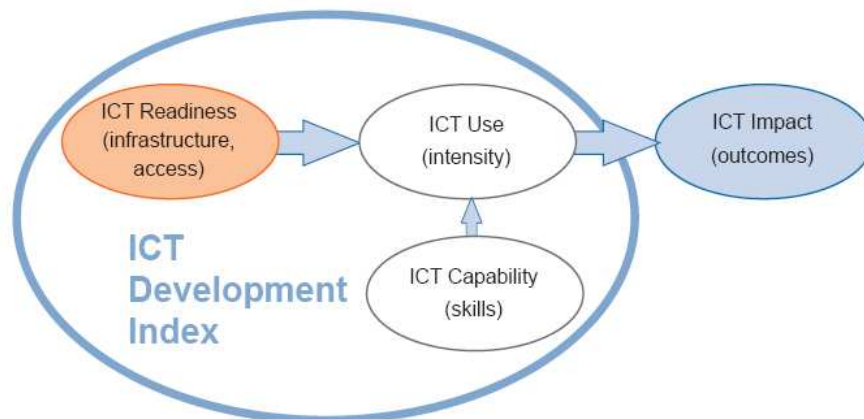


Figure. 1: Composition of the ICT Index Source: ITU

The developed world experience accessing most public services is mediated in a self-service mode via Internet portals which are part of the broader e-governance infrastructure (see e.g. www.usa.gov). Where e-governance is entrenched, public portals provide a single impersonal location to access most government-to-citizen (G2C), government-to-business (G2B) and government-to-government (G2G) services. These structures provide the advantages of convenience and greater transparency which lead to the reduction in administrative corruption. Heeks (2003) emphasized the importance of skills in the success of e-government projects. On the basis of this relationship between ICT pervasiveness as measured by the ICT Development Index and e-Government readiness, we therefore hypothesize that

H1: *ICT pervasiveness enhances the effectiveness of e-Governance outcomes in a country.*

A more neutral definition of corruption is the intentional noncompliance with arm-length relationships in transactions, the sole aim being the derivation of some advantage from this behavior for oneself or for related individuals. On the basis of this definition, any framework that ensures compliance with arms-length transactions between state institutions and the citizenry should be pivotal in any anticorruption reform.

Along the same line of thought, e-Governance enhances the participation of the governed in the process of decision making. Technology promotes impersonal relationships with institutions of state, giving the citizens unfettered access to these institutions. Lambsdorff (2007) characterizes the institutions of state in a world of free of corruption in which the bureaucracy serves the public, “be it through intrinsic motivations, incentives, threats of penalties, or peer pressure” as one that upholds the arms’ length principle. By enforcing arms-length transactions, public decision-making and access to services by the citizens is not influenced by personal relationships. This has the advantage of treating all actors equally. Technology by its very nature is impersonal and it has the true nature to establish impersonal relationships between the citizens and the bureaucracy, thus reducing corruption in a country. We can thus hypothesize that

H2: *ICT pervasiveness enhances the level of democracy in a country through increased participation of citizens in decision making.*

H3: *e-Governance enhances the level of democracy in a country through greater participation of citizens.*

Transparency public governance is based on the tenet of reducing monopoly over information including rules and procedure at the interface of the bureaucracy and citizens thereby reducing also the discretion of public servants and increasing accountability. The availability of information on government policies and procedures, a clear knowledge of the particular organization’s mandate together with arms-length relationships between the bureaucracy and citizens leads to greater transparency thereby reducing opportunities for corruption. In what Meijer (2009) calls computer-mediated transparency, technology-mediated transactions give people better information and thus contributes trust in institutions as these institutions also gain integrity in the eyes of the citizens.

Using technology as a tool to enhance trust and transparency in public institutions is gaining considerable traction globally. A new group called GlobalVoices (<http://transparency.globalvoicesonline.org/>) has a mission of “documenting the use of online and mobile technology to promote transparency and accountability around the world”. In the US, a new bill (H. R. 4389) whose provisions include “creating a searchable, sortable, and downloadable database for spending earmarks” was introduced by Rep. Mike Quigley (D-Ill.) on March 25, 2010. Central in that bill is the increased use of

technology and more disclosure by lobbyists and legislators on their activities. The American Recovery and Reinvestment Act of 2009 also makes pivotal the utilization of technology to enhance more transparency in government fiscal activities as a means to keep citizens up to date on public expenditures. Sturges (2004) asserts that technology systems are the most appropriate facilities through which transparency can be offered directly to the public to achieve intended goals. Thus we hypothesize that

H4: *Level of democracy in a country leads to a quality of state institutions.*

H5: *e-Governance enhances the quality of state institutions.*

H6: *Quality of state institutions leads to a reduction in the level of corruption measured by high scores on the CPI ranking.*

The research model for the research is shown in Fig. 2.

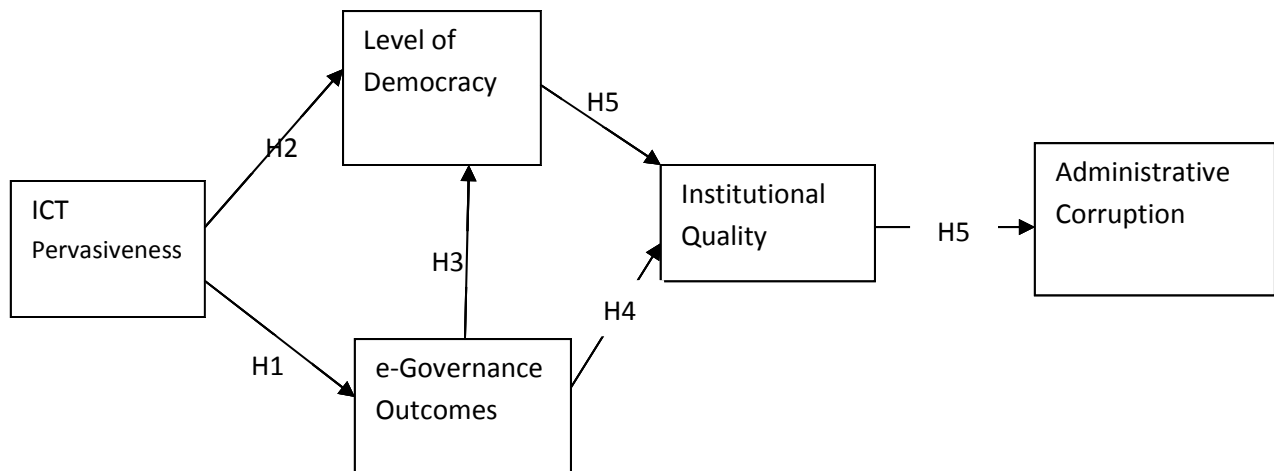


Figure 2. Research Model

DATA

Countries used in the study consist of 46 African countries. Africa has been chosen because of its peculiar battle with the scourge of corruption. Countries in Africa have always ranked in the bottom of the CPI Index since Transparency International started compiling the index in 1995. Somali was excluded because of a lack of a functioning central government across the whole country for nearly two decades now thus making the latent variables meaningless with respect to that country. The demographics of Mauritius, a small island of the coast of Africa in the Indian Ocean is culturally different from the countries in the main African continent and thus has been excluded from this study.

The research work uses a lot of indices as indicators for the various constructs in the model. Such an approach was used by Mauro (1997) and Sopper (2007). In the context of this paper, *ICT Pervasiveness can be seen as the extent of ICT use*

Korkpoe

ICT Pervasiveness on Administrative Corruption

through the availability of skills and infrastructure in a given country. Countries vary across the world in the availability, cost, skills and infrastructure. This measure is accessed yearly by the International Telecommunications Union through the publication of the ICT Development Index. This index, which is a composite consisting of sub-dimensions ICT Infrastructure, ICT Skills and ICT Access, ranks countries on a scale of 0 to 10, with 10 being countries with the highest ICT penetration and pervasiveness. The model uses the three sub-indices of the ICT Index for the year 2007 as indicators for the ICT Pervasiveness construct.

E-Governance readiness is a governance framework that facilitates citizens' participation and inclusion in decision making through the use of ICTs. The United Nations Public Administration Programme (UNPAP) started a survey in 2003 that ranks countries based on the e-Government Readiness Index. The 2008 survey *The UN E-Government Survey 2008: From E-Government to Connected Governance* (UNPAP 2008) ranked the 192 member States of the UN according to a quantitative composite index of e-readiness based on sub-indices of Web Measure Index, Telecommunication Infrastructure Index and Human Capital Index. The countries are ranked on a score of 0 to 1, with 1 being the highest. The 2008 survey is particularly appropriate for this study because in the words of UNPAP "This year's e-Government Survey 2008: From e-Government to Connected Governance presents an assessment of the new role of the government in enhancing public service delivery, while improving the efficiency and productivity of government processes and systems".

Democracy and its level in a country evade precise agreed definition among social scientists. In the context of this research we have adopted the criteria used by Freedom House which list among other things the "presence of a competitive, multiparty political system, a Universal adult suffrage, regularly contested elections conducted on the basis of secret ballots, reasonable ballot security and the absence of massive voter fraud, significant public access of major political parties to the electorate through the media and through generally open campaigning".

The 2008 Democracy Index compiled by the Economist Intelligence Unit (EIU 2008) is used as the indicator for the Level of Democracy construct. The 2008 DI was based on the assessment of electoral process and pluralism, civil liberties, functioning of government, political participation and political culture in 167 countries across the world. The DI is on a scale of 0 to 10, with 0 being authoritarian and 10 being full democracies.

The 2009 Institutional Integrity Index (II) and Governance Effectiveness Index are used as indicators for the Institutional Quality. II was adapted from World Bank's CPIA public sector management and institutions cluster average that includes

property rights and rule-based governance, quality of budgetary and financial management, efficiency of revenue mobilization, quality of public administration, and transparency, accountability, and corruption in the public sector. It is measured on a scale of 1 to 6 with six being the highest. According to World Bank's World Governance Indicators Project (Kaufmann et al, 2009), "government effectiveness captures perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies". This index scales from -2.5 to 2.5 with -2.5 being the worst and 2.5 being the best.

Administrative Corruption construct is measured using the CPI from Transparency International. According to TI's websites, "The 2010 CPI measured the degree to which public sector corruption is perceived to exist in 178 countries around the world. It scores countries on a scale from 10 (very clean) to 0 (highly corrupt)". Given the respondents of TI's surveys, the CPI might not measure the true perception of administrative corruption in a country. That is addressed as a limitation later in this paper.

The model for the analysis using lagged variables thus is shown in Fig. 3.

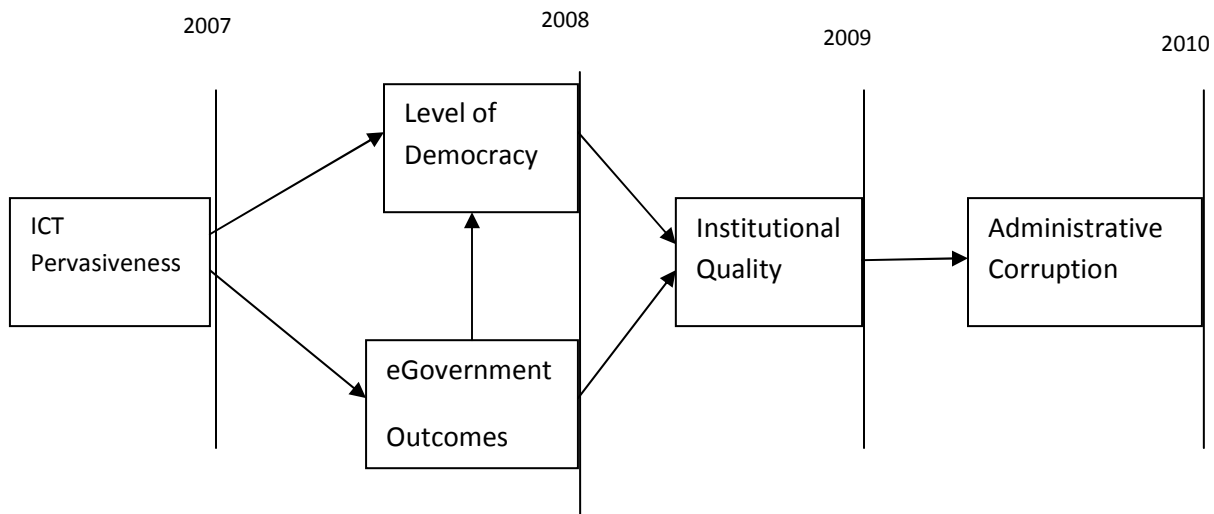


Figure. 3: Schematic representation of model for PLS analysis

The data from the various indices were standardized as z-scores because of the varying scales that were used by the various groups in the rankings.

ANALYSIS AND RESULTS

We used Partial Least Squares (PLS) modeling, a second-generation multiple regression analysis technique used in modeling complex hypothesized phenomena. PLS as a technique is popular in the IS research community because its

ability to model latent constructs under conditions of non-normality and small to medium sample sizes compared to other structural equation modeling techniques (Chin and Gopal 1995). According to Chin et al (1996), PLS shared similarities with regression but has the added advantage of simultaneously modeling the structural paths and measurement paths. We used SmartPLS version (Rhingle 2005).

MEASUREMENT MODEL

The variables in the model were modeled as reflective constructs. Reflective constructs are latent variables which are observed first before their effects are seen (Bollen et al. 1991). In a reflective model, the indicators reflect the underlying construct hence all the indicators are expected to be correlated. Jarvis et al. (2003) posit that the indicators are interchangeable hence eliminating an indicator should not change the conceptual meaning of a latent variable.

We run the bootstrap algorithm with 500 re-samples. Bootstrapping is a resampling technique used to give information on the validity of the parameter estimates and their significance (Temme et al., 2006). These are values of t-statistics. Fig. 4 shows the outer model and the associated t-values. All the t-values are significant at the $p < 0.05$ significant level so we did not have to drop any indicator.

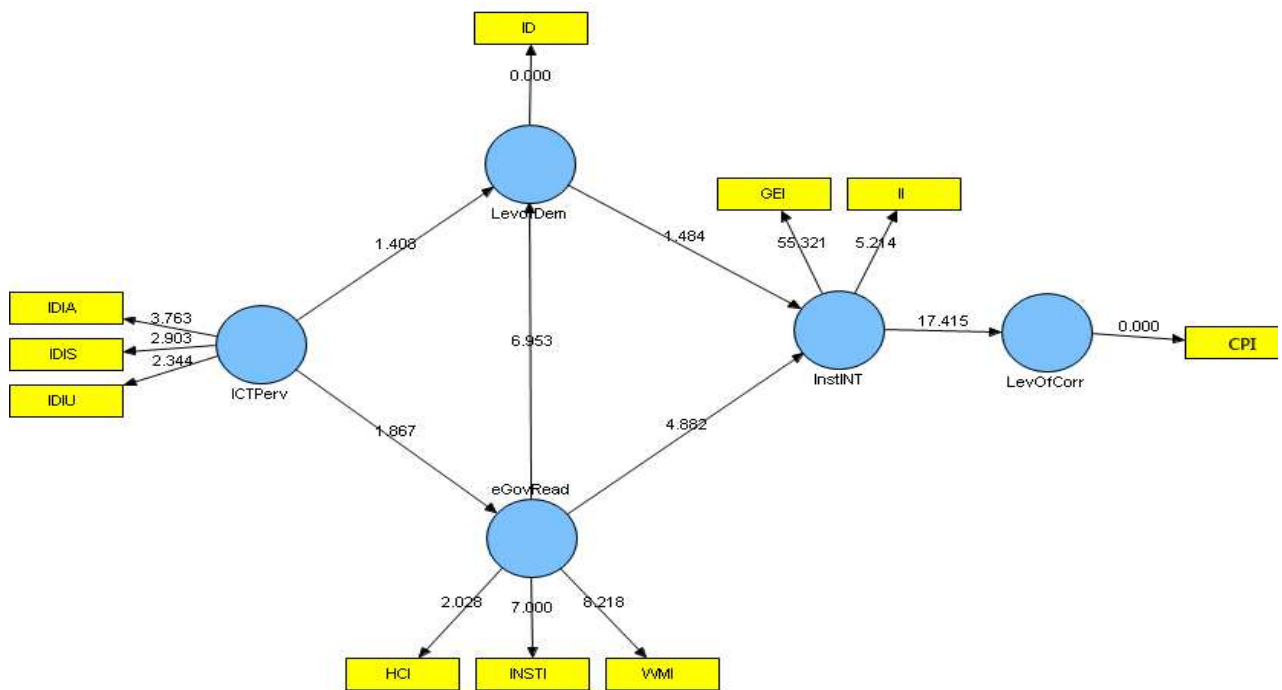


Figure. 4: Outer model

The psychometric properties of the indicators in the measurement model are assessed for their loadings, internal consistency and discriminant validity. We followed the recommendations of Fornell and Larcker (1981) that item loadings and internal consistencies greater than 0.7 is considered adequate for well established theoretical models. Thresholds lower than 0.7 are accepted for exploratory models.

The results of the factor loading (Table 1) and those of the composite reliability scores (Table 2) reveal the model meets the above criteria.

	LevOfCorr	InstINT	LevofDem	ICTPerv	eGovRead
CPI	1	0.8212	0.6178	0.4387	0.6216
II	0.5152	0.7937	0.1932	0.8984	0.4407
GEI	0.8487	0.9409	0.7264	0.458	0.7532
ID	0.6178	0.6031	1	0.1362	0.6613
IDIA	0.4614	0.7424	0.2098	0.9223	0.4263
IDIS	0.3561	0.5216	0.0698	0.8947	0.4243
IDIU	0.2138	0.446	-0.0699	0.7364	0.1281
INSTI	0.6021	0.5826	0.6991	0.0951	0.7778
WMI	0.415	0.5714	0.5272	0.3411	0.842
HCI	0.3271	0.4193	0.1541	0.6258	0.5519

Table 1. Results of Loadings and Cross Loadings.

	Composite Reliability	ICTPerv	InstINT	LevOfCorr	LevofDem	eGovRead
ICTPerv	0.89	0.86				
InstINT	0.86	0.69	0.87			
LevOfCorr	1.00	0.44	0.82	N/A		
LevofDem	1.00	0.14	0.60	0.62	N/A	
eGovRead	0.77	0.44	0.72	0.62	0.66	0.73

Table 2. Interconstruct correlations and reliability.

Note: Bold numbers on the leading diagonal are the square root of the average variance extracted.

In order to assess discriminant validity of the measurement items we followed Chin (1998) that indicators should load higher on their corresponding constructs than other constructs found in the model and also the square root of the average variance extracted (AVE) should be larger than the inter-construct correlations both along the row and down the column.

In Table 1, the bold numbers should that the indicators load more highly on their respective constructs than on other

constructs. Also in Table 2, the leading diagonal (where applicable) shows that the constructs share more variance with their indicators than other constructs. Table 3 has statistics to confirm the consistency of the measurement model.

	AVE	Composite Reliability	R Square	Cronbachs Alpha
ICTPerv	0.73	0.89	0.00	0.84
InstINT	0.76	0.86	0.55	0.70
LevOfCorr	1.00	1.00	0.67	1.00
LevofDem	1.00	1.00	0.47	1.00
eGovRead	0.54	0.77	0.20	0.56

Table 3. Consistency statistics.

The composite reliability values are a measure of internal consistency. The minimum value is 0.7 (Werts, Linn and Joreskog 1974). The values in Table 4 confirm high internal consistency. Average Variance Extracted (AVE) is a measure of the amount of variance that the constructs capture from their indicators relative to the amount due to measurement error. Fornell and Larcker (1981) recommend minimum thresholds of 0.5. The high values as shown in Table 4 is an indication of the reliability of the items in measuring their constructs. Cronbach's alpha is also a measure of the correlations among the set of items measuring a given construct. 0.7 is generally accepted for developed models. The values are all acceptable given that this is an exploratory model.

STRUCTURAL MODEL

The structural or inner model looks at the strength of the paths that hypothesize the relationships among the constructs. These strengths which are betas are in effect t-values whose significance is a measure of the strength or otherwise of a given path. Fig. 5 shows the path coefficients and the explained variances in the dependent variable Level of Corruption.

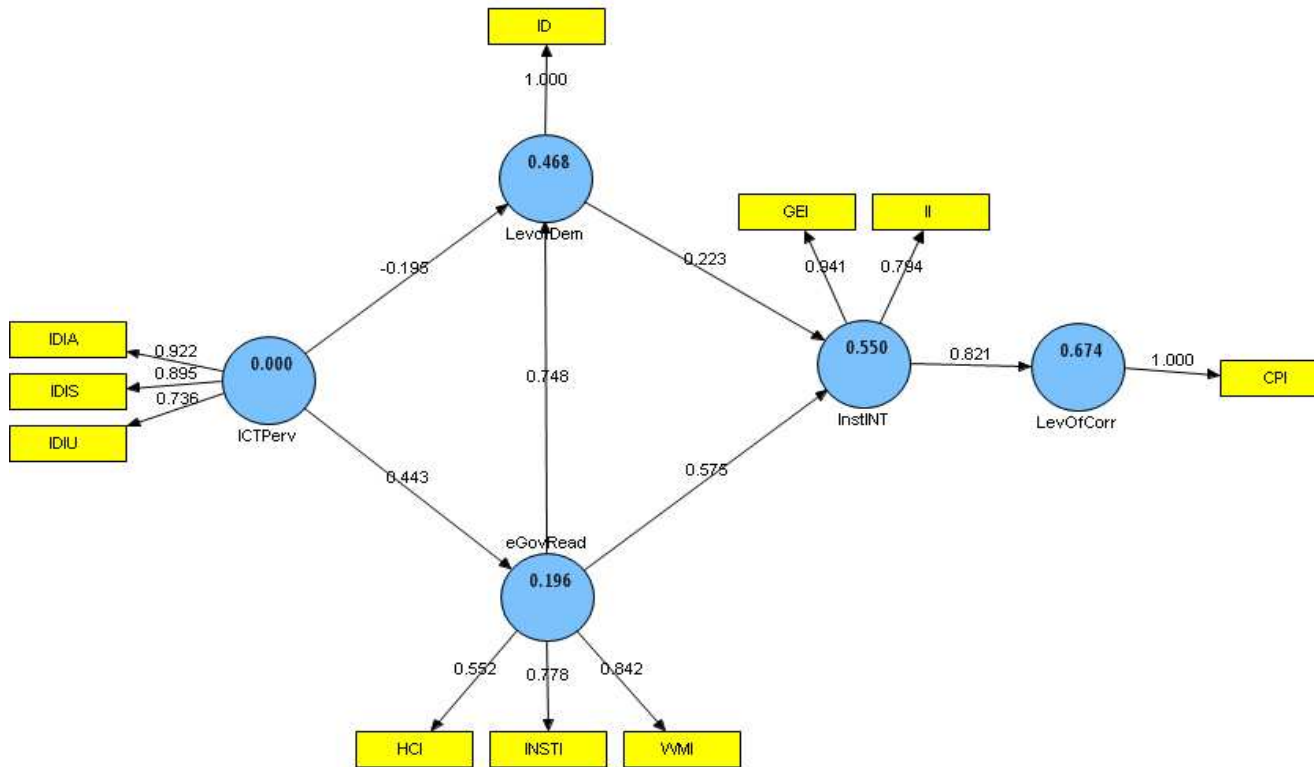


Figure 5. Inner model

From Fig. 5, the model accounts for 67.4% of the variance in the level of corruption.

Table 4 shows the results of the hypothesis testing.

Hypothesis	Result
H1: <i>ICT pervasiveness enhances the effectiveness of e-Governance outcomes in a country</i>	Supported
H2: <i>ICT pervasiveness enhances the level of democracy in a country through increased participation of citizens in decision making</i>	Partially supported
H3: <i>e-Governance enhances the level of democracy in a country through greater participation of citizens.</i>	Supported
H4: <i>Level of democracy in a country leads to the quality of state institutions</i>	Supported
H5: <i>e-Governance enhances the quality of state institutions</i>	Supported
H6: <i>Quality of state institutions leads to a reduction in the level of corruption measured by high scores on the CPI ranking</i>	Supported

Table 4. Summary of hypothesis tests

DISCUSSIONS

The basic questions that drove this research were (a) how does technology and its pervasiveness in a country enhance institutional integrity? and (b) does institutional integrity lead to a reduction in the level of corruption in a country? These questions have been addressed through a complex hypothesized model that empirically tested the interaction of five constructs that looked at the effect of technology in promoting transparency in the institutions of state thereby reducing corruption. There is a lot of work to be done in this area within the broader framework of technology-inspired good public sector governance especially in the developing world where scarce capital aside, corruption has defied every effort at its eradication thus remaining a big impediment to development. The findings of this research work and possible agenda for further research within this stream are addressed in the findings that follow.

FINDINGS

The common themes that can be identified in all the definitions of corruption in extant literature (Rose-Ackermann, 1994, Bardhan 1997, The Asian Development Bank) are a lack of accountability, an inordinate amount of discretion, a monopoly over information and procedures and the lack of transparency in administrative transactions. If corruption is seen within the framework of transaction cost economies as a contracting problem, then as a first step openness and transparency are essential to fixing this defect in contracting. Lambsdoff (2007) see a two-tier approach to solving the problem of corruption - fighting the canker itself and combating its causes. Technology is effective in either approach. Technology mediated transactions are meant to reduce opportunities for corruption through arms' length transactions which are transparent, verifiable and accountable.

Administrative corruption anywhere is the result of arcane rules which give an upper hand to the bureaucrats thus enhancing further their discretionary powers. Public service reforms are good are a first step in streamlining these rules which are then migrated to electronic platforms to reduce the monopoly and discretion of the civil servants at the same time as it increases accountability and auditing (Grönlund, 2010). A technology platform also according to Bhatnagar (2001) increases competition and provides alternatives for services. Citizens thus can shun those sector groups they understand or perceive to be corrupt.

In what Meijer (2009) calls computer-mediated transparency, technology promotes transparency which gives people better information and thus contributes to the rationalization of society. As the results of the model show, deepening technology through increases access, enhanced skills and an extensive infrastructure are antecedents to the effectiveness and strength of the institutions of state which ultimately promotes transparency and lead to low levels of corruption.

Transparent governance using technology is particularly important at the lower levels of governance – the local authorities – which are closer to the poor. Given that corruption disproportionately hurt the poor (Ndikumana 2006) through the misallocation of resources and underinvestment in services that directly enhance the welfare of the poor, a techno-centric approach to stemming corruption will give immediate results and relief to the suffering poor.

As the model shows, there is significant support for building governance integrity systems that are accountable, increase participation in governance by citizens and promote a culture of transparency via a techno-centric platform of delivering government to the people. The hypothesis on the effects of ICT pervasiveness on the level (H2) of democracy is partially supported. At this stage we posit that this could be due to the low level of technology use in the sample of countries selected especially in areas like e-voting where technology is used directly. We recommend further research in the area. Overall however our model is highly predictive of the effect of ICT pervasiveness on the level of corruption as mediated through e-government readiness, level of democracy and the quality of state institutions in the selected countries.

LIMITATIONS

Our research acknowledges some practical limitations. First of all, the sample is selected from the same geographical area with almost the same underlying culture. Corruption has deep cultural influences and connotations (Barr and Serra 2006). As such limiting the sample to one geographical area reduces the generalizability of the findings.

Secondly, the use of Transparency International's Corruption Perception Index (CPI) as a measure of the level of corruption in a country even though widespread is generating controversy in the anticorruption research community lately. The sample used in the CPI is not broad enough and there are also arguments about the methodology used (Lancaster and Montinola 2001, Johnson 2000, Urra 2007). Future research should use other indices and assess their effects on the predictive ability of the model.

CONTRIBUTIONS AND IMPLICATIONS

Our work makes contributions at several levels both for policy and research. First of all, public policy for dealing with the problem of corruption has focused inordinately on trying to "fix" people through sunshine legislation, judicial reforms, freedom of the press and streamlining the public sector. It must be admitted that these are a necessary first step to dealing with the problem. The over fixation on laws making people better has however spawned a huge anticorruption industry with little by way of results (Persson, Rothstein and Teorell 2010; Lawson, 2009; Bjorvatn, Torsvik and Tungodden 2004).

In most countries where these reforms are the rage corruption has remained stable or deteriorated through a process of decentralization or concentration of corruption as opportunities of corruption migrate from one level of government to the other or from one group of people to the other (Levi, 2007). Any system of anticorruption reform that leaves the human element still central is bound to fail especially in “soft states” with low levels of social discipline (Myrdal, 1970). Public sector reforms, sunshine laws, realignment of incentives of the bureaucrats and economic reforms without doubt are *sine qua non* in any country with economic growth on its agenda. Given the performance of such strategies however in the area of anticorruption, we think placing technology at the heart of these reforms will have far reaching effects that will stem the tide. Technology should be seen by policy makers as a strong weapon in the fight against administrative corruption.

For research, we think this work opens a new avenue for further research in building the phenomenon as a conceptual model with hypothesized links. We are not aware of any work in this area thus this work starts a stream of research in using a structural equation modeling approach to analyzing the problem of corruption at any level.

CONCLUSION

Our research set out to investigate the effects of ICT pervasiveness on the level of corruption in a country. We found out using a sample of 46 African countries that ICT pervasiveness as predicted influences effectiveness of state institutions which mediate government services to the citizens. Technology achieves this by a process of computer-mediated transparency that enhances the quality of state institutions thereby reducing the monopoly and discretionary powers of the bureaucrats while increasing accountability in transactions with citizens. Ultimately, our work, we think is a trailblazer in this area of technology and governance and hopefully it is the start of rigorous study of the use of technology in streamlining public sector governance to promote development.

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