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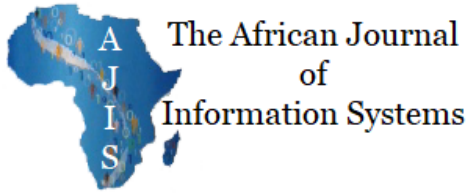
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# E-Governance as an Alternative Antecedent to a Lean Public Sector : Theory and Evidence

Research Paper

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## ABSTRACT

The ever growing size of the public sector has been a contention in theory and practice. In parallel, the public sector use of Information Communication Technologies (ICTs), otherwise known as Electronic Government has had a transformative potential. Inspired by these competing interests, this paper set out to study the relationship between investments in e-Government and the size of public sector. Informed by Banks-Weingast model of bureaucratic discretion drawn upon political science, the research estimated the linkage. Using a balanced panel data of Kenya's key ministries for a 10 year period (2004-2014), e-Government expenditure, consumer price indices (CPI) and gross domestic product (GDP), the study found that 1 per cent increase in the intensity of investment in e-Government infrastructure leads to 0.295 per cent reduction in the size of the public sector, and this forms the main contribution in the paper. In theory, the study presents a robust model that enables the viewing of the interrelationship from a newer vantage point using a perspective foreign to information systems discipline. In practice, the integrative thinking reveals that while investments in e-Government may control government's recurrent costs, it does counter bureaucrats' self-interestedness, an ideology which appears to thrive in a world of information asymmetry. Thus, the paper demonstrates that e-Government is a technological determinant of the size of a bureaucracy and may act as an alternative consideration to achieve a leaner public sector.

## Keywords

E-Government, Panel Data, Public Sector Size, Developing Country

## INTRODUCTION

In developing countries, a substantial growth in Information Communication Technologies ICT investments is evident (Bankole & Mimbi, 2017). ICT enhances operational efficiency. Guma (2013) observes that the traditional structure, synonymous with massive bureaucracies, is gradually fading in public sectors. Though Mtingwi and Van Belle (2013) observe that high costs are involved in developing such infrastructure in developing countries, Mimbi and Kyobe (2012) postulate that the ICT driven public sector reforms are due to the recognition of the transformative potential of e-Government. For instance, in Kenya, despite some reforms, the size of the public sector is still a challenge. The sector expenditure has continued to rise (Kilelo, Beru, & Nassiuma, 2015). The government still grapples to optimize the size of the public sector (Presidential Strategic Communication Unit, 2013) while no integrative theory exists to guide this pursuit. In all these examples, e-Government has come to fore as having the capacity to re-engineer the sector (Ondego & Moturi, 2016). Thus, this paper presents a theoretical model that may be used to empirically examine the size of the public sector consequent upon investment in e-Government. Kenya, a developing country, is used as an empirical setting. Prior, it is imperative to present some definitions as adopted in this paper. “e-Government” represents the use of public sector ICTs. While “public sector” refers to a publicly funded entity that provides services on behalf of government, ICT extends the definitions of Frenzel and Frenzel (2003). It is a tool that not only alters the balance of power but also enhances information dissemination towards improved service delivery. While “GDP” is used as a measure of a country’s living standards (Bernanke & Gertler, 1989), investment in e-Government measures the annual spend-per-ministry on e-Government. These are measured in per capita terms to account for the population changes affecting policy choices. Since the paper uses nominal expenditure, a factor adjusting for the changes in price levels, Consumer Price Index (CPI) is used. This is defined as the weighted average pricing of a basket of goods and services (Bunday, 2015).

## LITERATURE REVIEW

### The Empirical Setting

Kenya, an East African country, is rapidly growing into a regional ICT hub (Ondego & Moturi, 2016). As of the end of 2016, it had a population of approximately 45.4 million (KNBS, 2017). Kenya has maintained a relative politico-economic stability even in the face of fiscal pressures and public sector reforms (World Bank, 2018). The ICT sector has been one of the lowest GDP contributors at only 0.9 percent. Though Kenya settled on a 3-year precautionary facility from IMF (ibid) aimed at reducing public debt burden, there have been efforts to increase both domestic and foreign savings (Aduda, Chogii, & Murayi, 2014). This is

expected to come further under focus due to the demands of the new and more costly systems of devolved governance (Nyanjom, 2011), in which red tape bureaucracies and inefficiencies have considerably disillusioned the public (Mbate, 2017). Badaso (2014) avers that, when used appropriately in the public sector, e-Governance offers better costs control for African countries seeking to refocus their operations strategy.

## **Public Sector Reforms in Kenya**

The immediate African post-colonial public service was inherited from the British, thus adopting the British bureaucratic practices (Gaskins, 2013). To address the associated anomalies, independent governments pursued the strategy of “Africanisation” (Cohen, 1980), which aimed at replacing colonial masters with local expertise. In Kenya, this led to a rapid expansion of public services and a resultant high wage bill (Omolo, 2010). Nzioka (1998) observes that the size of Kenya’s public sector grew by about 5.5 percent per year between 1963 and 1991. The government became the largest employer and, in 1990, began experiencing expenditure pressures (Government of Kenya : Parliament, 2013) and an unsustainable public sector wage bill (Aseka, 2002). Mbuia and Ole Sarisar (2013) argue that, in a broader sense, the Kenyan public sector has never discouraged inefficient resources’ utilization. There is a need for a governance approach that is hinged on transparency and efficiency. Therefore, the government embarked on sector reforms. In 2014, the Parliamentary Budget Office recommended a rationalization of the public sector by cutting down its size in terms of staff numbers and associated expenditures. Indeed, over 50 percent of the country’s total revenue is consumed by the public wage bill. This is against an internationally accepted ratio of 30-40% (Government of Kenya: Parliament, 2013). Public wage bill to GDP being 7% (ibid). This is above those of other countries in the region including Tanzania, Uganda, and Rwanda. (Africa Economic Outlook, 2012; Holmes, 2013). Since the reforms are aimed at lean management (Hope, 2012), e-Government has a potential tool to re-engineer the sector (Government of Kenya: Parliament, 2013).

## **ICT Sector Expenditure**

Kenya has been attempting to emerge as a champion of transformative ICT use in East Africa. The sector is becoming the main driver of regional economics, expanding annually by an average of 20 percent (World Bank: Kenya Economic Update, 2013). In 2011, Government of Kenya: MoICT (2014) reports that the sector expenditures were about US\$ 860,000,000. The public sector spent 0.3 percentiles on e-Government as a proportion of the overall expenditures. This is 20 times less than the public sector industry’s average of 6.5 percent, and a global benchmark of 18 percent. The argument made is to contain administrative costs (ibid). So, in an exploratory research, Peake (2013) discovered that the top five vertical sectors contributing

to ICT expenditure are communications (20.5 percent), consumer (14.9 percent), government (14.7 percent), finance (12.9 percent), and manufacturing (7.2 percent). Therefore, given the increasing importance of public sector ICTs, it is imperative to empirically explore the spending impacts on governance structuring or costs.

## **Public Sector Performance and Expenditure**

In the 1980s, global economic decline triggered public sector performance-based reforms. In this regard, the significance of public sector expenditure has been a contention in academic debates (Olaleye, Edun, Bello, & Taiwo, 2014), including classicalists as Wagner, who argued that public expenditure is an endogenous factor in national income (Wagner, 1890). Though Keynes (1936) disputed this, the debate continues. In all, Barro (1991) avers that government expenditure has different effects and is largely determined by its size (Dizaji, 2012). Thus, Garand (1988), while attempting to understand government growth in the United States (US), defined “government size” in terms of “state government expenditure as a proportion of total state economic output”. He does this by taking cognizance of explicit price deflators being employed for the public and private sectors. Therefore, it can be argued that total state personal income can be used as a surrogate measure for state economic output. Though not a perfect measure, the personal income pattern over time is sensitive to overall state economic output (ibid). It is because of these complex linkages that this paper is motivated to explore the influence that investment intensity in e-Government has on public expenditure, which is defined in terms of size of the public sector. While some scholars have argued for a direct linear link between e-Government investments and the consequences in the public service (Savoldelli, Misuraca, & Codagnone, 2013), others have advanced a theory that the relationship between these depends on a third level variable. They propose GDP or management philosophies to form a bivariate relationship (Gatautis, Medziausiene, Tarute, & Vaiciukynaite, 2015). In all, these have led to inconsistent and contradictory results (Yao & Liu, 2016), thus the need to understand the relationship from a newer theoretical perspective incorporating the political science domain within which the public sector bureaucracy is placed and may be better explained.

## **Bureaucratic Politics Discretion Model**

This is a political science model attributed to the works of Banks and Weingast (1992). Like the legislative “rent seeking” model, this is adapted from the seminal works of Niskanen (1975). However, its main point resides in its special focus on the budgetary relationships in the public sector. The bureaucrats are assumed to price public services at the maximum price that the politicians or the legislature is willing to allocate. Under such circumstances, the production happens at a level where the marginal cost exceeds the marginal

value. This results in a demand-constrained outcome, occasioned by lack of adequate information or “information asymmetry” on the part of legislature (Banks & Weingast, 1992). Indeed, economic crime or “corruption” flourishes in such an information asymmetric environment (Gaskins, 2013). For example, in Uganda, an information campaign presented stakeholders with public funding information for the grants to local academic institutions (Reinikka & Svensson, 2005). The information led to a significant reduction in fund misallocation. Thus, it can be argued that technological factors influence the sizes of misappropriations or budgets of organizations (Wood, Shin, & Devaraj, 2008). In the digital era, one of such influences is e-Government. Therefore, Banks and Weingast (1992) contend that agencies fair well where bureaucrats’ informational advantage is diminished to the minimum. Interest groups should be able to monitor agency’s actions by providing independent sources of information (ibid), which leads to lower gains for the bureaucrats. This model fits the research problem as it positions e-Government, a burgeoning information systems phenomenon, as a tool capable of improving system functioning by minimizing information asymmetry, a commonplace in African public sector bureaucracies. The latter is positioned in the political science domain. In this model, e-Government provides elements of efficiency in the public sector. Unlike the legislative “rent seeking” model, the bureaucratic discretion model explains the easing of the dysfunctions of costs using public sector ICTs as presented in Figure 1:

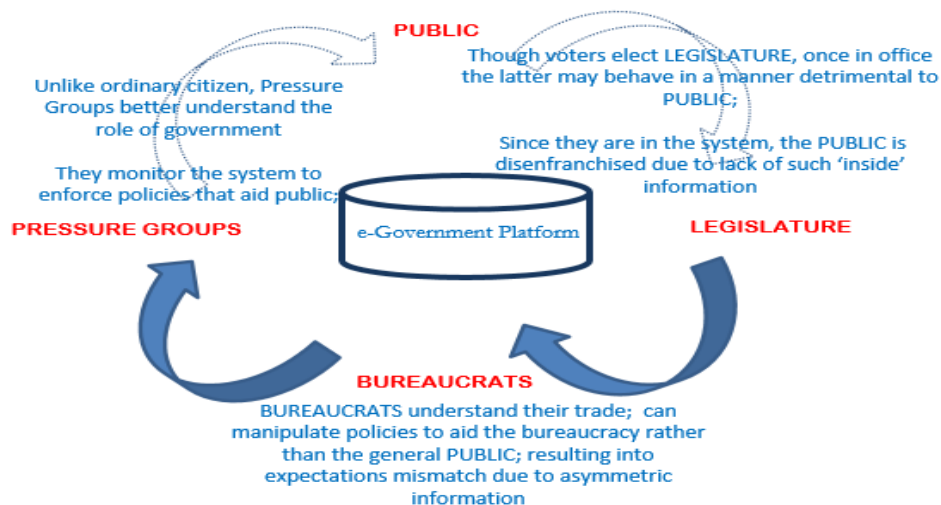


Figure 1: Bureaucratic Discretion Model

## EMPIRICAL METHODS

### Philosophical Frameworks

Frameworks guide the behavior of the researcher (Jonker & Pennin, 2010) in attempting to understand social phenomena. In this paper, the researcher intended to examine the public sector size consequent upon

investment in e-Government. Objectivism as an ontology and positivism as an epistemology are argued as adequate to inform the research problem. These are informed by the theorized causal laws (Hill, 2014). Thus, e-Government as well as investment in it is considered independent and separate from the researcher. The consequent size of the public sector has an objective reality contingent upon empirical data available (Keat, 1981). The study focused on the presupposed cause-effect relationship between e-Government investment and the size of the public sector. It quantifies the strength of the relationships, thus conforming to the philosophical view of positivism.

## Data Collection

The secondary quantitative data was collected from historical documents such as economic surveys, audited financials, census, World Bank facts and archival appropriation accounts for Kenya, all of which were converged in a triangulated fashion. The study focused on critical top ministries in terms of expenditure occupying as much as 80 percent of the national budget over the ten-year period since Kenya adopted an e-Government strategy paper (2004) - *Education, Medical Services, Transportation & Infrastructure, Foreign Affairs, Energy, Finance, Agriculture and Internal Security* (Institute of Economic Affairs, 2014). These are the public services that the government is responsible for supplying at the national level (ibid). The variables of interest included total government expenditures, e-Government expenditures, total recurrent estimates, inflation rates, the consumer price index (CPI), population size, the gross domestic product (GDP), and total personal income across the eight ministries from 2004 to 2014. Given that the data was collected over a 10-year period as well as across a number of government ministries, the study was longitudinal in terms of time period of observations on a single ministry and cross sectional in terms of the snap shot of the various ministries at a given point in time. Furthermore, the credibility of the data was critical and achieved through crosschecking various data sources (Banister, Parker, Runswick-Cole, Sixsmith, & Smailes, 2011).

## Data Analysis

The data captured was analyzed in STATA due to its suitability for large time series econometric analyses and the integration of cross-sectional panel data. Previously, missing value analyses were conducted. In addition, a stationarity analysis was conducted to establish whether a statistical character of a variable does vary with time (Baltagi, 2013). More often, a non-stationary data is unreliable and cannot be modeled (ibid). The Levin-Lin-Chu (LLC) and Im-Pesaran-Shin (IPS) are the most popular unit root tests for testing stationarity (Asghar, Nasreen, & Rehman, 2011) and were adopted for this research. While the LLC does not provide for the possibility of only some sector variables containing a unit root, the IPS test is not so

limiting. IPS requires that the ration of N to T tends to zero ( $N/T \rightarrow 0$ ) for  $N \rightarrow \infty$  where N is number of panels / ministries while T is time periods.

The study adopted panel data analytical techniques to enhance the accuracy of the estimations. The estimations of coefficients in the technique is done through pooled ordinary least squares (OLS), random effects (RE), or fixed effects (FE). In this paper, there was a possibility of a FE, RE, or OLS model. Thus, the Hausman specification test was used to determine the appropriate model choice between FE and RE (Hausman, 1978). Thereafter, Breusch & Pagan's (1980) Langrange Multiplier (BP-LM) or an F test was used to determine whether FE/RE model is more appropriate than pooled OLS model. These tests helped in determining the consistencies and efficiencies in the estimators.

## ANALYSIS

### Missing Data Analysis

The data was checked for accuracy and missing values to be represent informational (Gandomi & Haider, 2015). The rule of the thumb puts the threshold at 20 percent (Hair, Black, Babin, & Anderson, 2010) and the results are as shown in Table 1:

Table 1: Missing data percentages (N=80).

Variable	Missing Data %
Total Personal Income	0%
GDP	10%
Re-based GDP	0%
Population	0%
Total Expenditure	11%
Development Expenditure	15%
Recurrent Expenditure	15%
Governance Index	0%
Consumer Price Index	0%
Inflation	0%
e-Government	10%



### Stationarity Analysis

To enhance the power of estimation, a stationarity analysis was conducted. The results of unit root tests indicate that all variables are stationary. In part, this means that fixed effects may be the appropriate analytical model. However, to achieve robustness in the results, appropriateness of all the three models ((i.e. OLS, RE, and FE) were tested using panel data estimation.

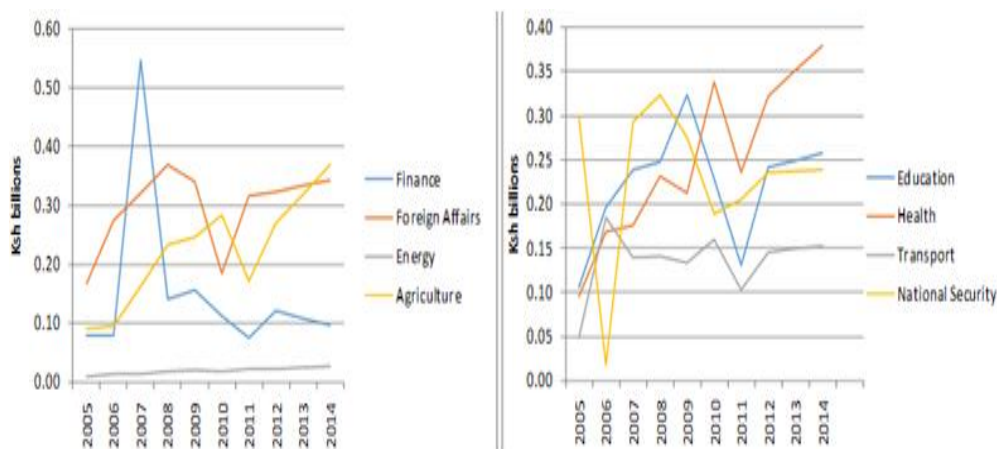
### Choice of Appropriate Model

To facilitate choice between OLS and RE models or between FE and RE models, the Breusch Pagan LM (BP-LM) and Hausman Tests were considered. The Hausman specification test was used to determine the appropriate model choice between FE and RE. Thereafter, a Breusch & Pagan (1980)'s Langrange Multiplier (BP-LM) or an "F Test" was used to determine whether the FE/RE models are more appropriate than the OLS.

### Descriptive Statistics

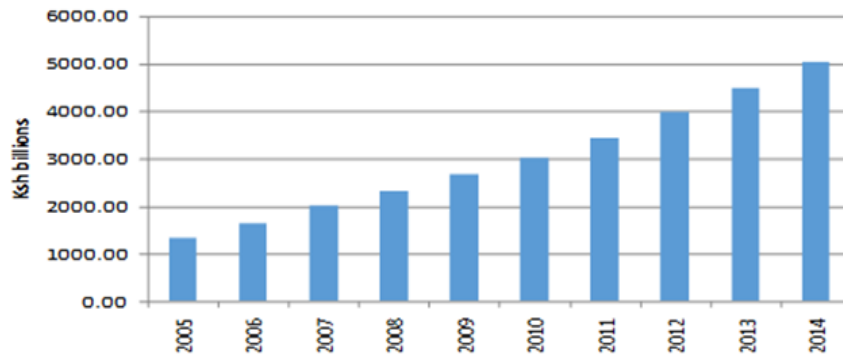
This was biased towards graphical presentation due to a need to better present trends over time (Minter & Michaud, 2003).

Table 2: Investments in e-Government



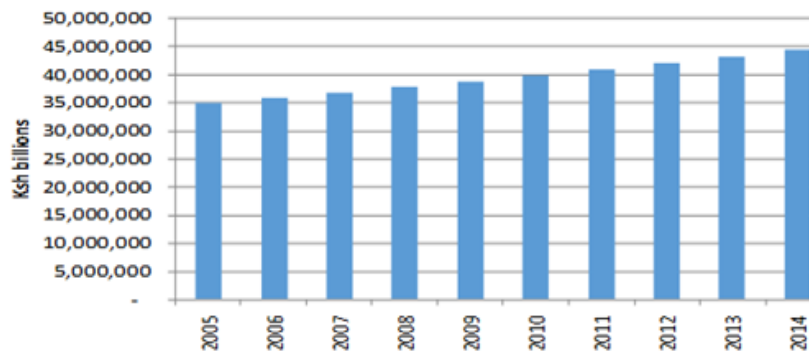
In this paper, nominal GDP was used as a control for the effects of business cycles (Bernanke & Gertler, 1989). GDP captures total income in an economy and its performance has a direct implication on revenue collections (Ghamdi, 1991), which affects the funds available for investment in e-Governance. It is therefore expected that increased levels of GDP should result in increased levels of e-Government investment (other factors being constant). Table 3 presents the GDP changes between 2005 and 2014.

Table 3: GDP Trend 2004-14



Due to the trend in GDP growth, increased e-Government investments are expected. The study uses nominal values of expenditures by factoring a measurement of the overall pricing levels in the economy using the consumer price index (CPI). Furthermore, over time the country population continues to grow. In this analysis, this is controlled by conducting the analyses in per capita terms. In Table 4 is a depiction of the growth:

Table 4: Population Trend 2004-14



**Size of Public Sector**

This was captured as a ratio of total recurrent expenditures to total income, which is a surrogate measure for ministry or sector GDP (Garand, 1988). In e-Government, meanwhile, investment was measured in terms of its intensity, which is the proportion of e-Government expenditure to total expenditure.

Thus, the size of the public sector is presented as:

Equation 1: Public sector size Model

$$SIZE_{it} = \beta_0 + \beta_1 ICT\_INTENSITY_{it} + \beta_2 GDP_t + \beta_3 CPI_t + \epsilon_{it}$$

SIZE measures the size of the public sector; ICT\_INTENSITY captures investments in e-Government as a proportion of total expenditure. Therefore, to specify an empirical model, a BP-LM test was done to compare which - between a pooled OLS model and a RE model - is appropriate. The results show that the null hypothesis in favour of a pooled model cannot be rejected. This was supported by the very high (1.0000) test probability. This implies that an OLS model is more appropriate for examining the study objective. Therefore, the model is estimated as an OLS model and the estimations are presented in Table 5:

Table 5: Estimations on OLS model

Dependent Variable: Log (Size)

Independent Variables in Log:	Coefficient & Standard Error	
e-Government Investments Intensity	-0.2950***	(0.0683)
GDP	0.7611	(1.7975)
CPI	-1.1619	(2.3765)
Constant	19.2025	(29.3263)
Adj R <sup>2</sup>	0.3252	
No. of Observations	35	
F (3,31) (P-value)	6.46	(P-value : 0.0016)

Note: \*, \*\*, and \*\*\* indicate 0.10, 0.05 and 0.01 levels of significance, respectively.

It is evident that the intensity of investment in e-Government significantly impacts sector size. This supports the postulation of Fiorina & Noll (1978) that “rent seeking” by bureaucrats increases the cost of public service. This, in essence, inflates the size of the public sector in terms of associated expenditures. This may result in an excessively bloated and bureaucratic administrative structure. In this research, the relationship is at 1 percent level of significance. In particular, a unit percent increase in the intensity of investment in e-Government leads to 0.295 percent reduction in the size of the public sector. Furthermore, the model indicates that 32.52 percent (Adjusted R<sup>2</sup> = 0.3252) of variations in ministry size are accounted for by variations in investments in e-Government, GDP, and CPI. However, the intensity of investment in e-Government is the only significant determinant in the model. In sum, the model is significant as specified

and is evident from the F-test reporting a probability of 0.0016, which is below 5 percent and 1 percent critical levels. These results have implications on both the theory and the policy.

## DISCUSSION

The rise in e-Government expenditure is explained by the adoption of Kenya's ICT policy (2006) alongside the e-Government strategy paper (2004). The policy papers envisioned efficient information services. In addition, the new constitution of 2010 challenged the information hegemony. One of the policy implications was to improve efficiency in public service delivery (CoK, 2010) as well as manage the cost of offering the services to levels of efficiency. This agrees with Mwangi's (2014) observation that the cost of public service is exorbitant or highly exaggerated. This may explain increased expenditures in e-Governance initiatives after 2010. Noteworthy is the Electronic Single Window System, which is a Vision 2030 flagship project that is meant to enhance cost efficiencies and reduce bureaucracies in international trade (Kubai, 2015).

In the paper, since the analysis intended to establish whether or not and how strongly the investments in e-Government and the size of the public sector are related. Indeed, a relationship exists. The higher the intensity of investment in e-Government, the smaller the size of the public sector bureaucracy. The investment in e-Government drives transparency and may lower corruption which Lambsdorff (2010) avers as being a factor of bureaucratic quality. E-government reduces the discretionary power of public officials and bureaucrats, and in return lowers their preferential gains (Kochanova, 2015). In fact, Banks and Weingast (1992) contend that agencies fair better with a reduced informational advantage on the part of bureaucrats. This may call for some forms of monitoring technologies to shrink information asymmetry. Without this, there is a possibility of a higher quantity public sector production cost, which essentially represents higher expenditures that may not necessarily imply a higher quality of agency output. This is wasteful and inefficient (Coolidge & Rose-Ackerman, 2000). Indeed, e-Government opens up information flow between the legislature, bureaucrats, and citizens in a transparent manner (Rodríguez-Domínguez, Sánchez, & Álvarez, 2011). In return, this weakens bureaucratic tendencies (Haque, 2002) and enhances public value by shrinking the size of the public sector bureaucracy. In an African developing context, e-Government may thus act as a change model to optimise size of the public sector (Mistry & Jalal, 2012). In this research, the modelled relationship is found at 1 percent level of significance. To be specific, a unit percent increase in the intensity of investment in e-Government leads to 0.295 percent reduction in the size of the bureaucracy of the public sector. The overall model is significant as specified and as such has pertinent implications on the theory and the policy.

## CONCLUSION

Though a range of literature on the impact of e-Government with regards to the sizes of organizations exists, much of these have largely focused on developed economies and the private sector, as well as using domain-specific theoretical perspectives in information systems (IS). Indeed, the focus has been less extensive in the public sector. Still, the concern about the size of the public sector has been a subject of debates in IS research and policy. Given the contradictory results, this study set out to mainly estimate the size of a public sector consequent upon investment in e-Government in a developing country's context from another vantage point. This was informed by a theory drawn upon political science. Analyses were conducted across a panel of 8 key ministries of the Government of Kenya and a significant relationship was found. In fact, an enhancement of the intensity of e-Government investment by one percent presents a proportional reduction in government size by 0.295 percent. To the best of the researcher's found literature, no research endeavor has attempted to estimate these from a theoretical perspective of bureaucratic politics discretion. This offers substantive empirical evidence that e-Government investments can be used to contain the growing sizes of the public sector in a developing country's context. This research contributes to the e-Government value theory by presenting a new theoretical insight for value researchers in information systems. The developed model shows that various factors may need a special focus during the formulation of integrated e-Government policies in developing countries. This is better weighed using the magnitudes of influence as presented in the model. Though the research discovered an insignificant impact on the time lag following investment in e-Government in the public sector, future studies may explore this concern with an effect of a longer time period.

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