The Link between the Conceptualization of eGovernment and its Perceived Impacts: an Exploratory Empirical Study in Kenya

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Abstract: This paper examines how eGovernment is conceptualized and the possible relationship with the expected impacts of eGovernment in a developing world context. The aim is to shed some light on why eGovernment initiatives often fail in developing world contexts. This research was based on an exhaustive survey among government agencies and consultants in Kenya. The dimension of eGovernment impacts was initially operationalized in terms of connectivity, openness, efficiency and effectiveness. Government conceptualizations could be classified under tool view, proxy view, ensemble view, computational view and nominal view. Interestingly, the empirical data yielded very different impact factors than originally envisaged, which were enhanced interactions and accessibility, enhanced cooperation and awareness, a better connected public administration and enhanced citizen opportunities. Canonical function analysis found a supply-side focus which linked connected government to the conceptualization of eGovernment as an Evolving Artifact. The main contribution of this paper lies in highlighting the fact that the implementation of western information technologies in developing countries will be shaped by how their impacts are perceived. Thus both purveyors of the technologies and researchers can be made aware that, because of the very different expectations and contexts, these technologies may be conceptualized differently than in developed countries. In addition, the paper demonstrates a practical research approach to assist in uncovering these conceptualizations more explicitly.

Keywords: conceptualizing eGovernment, developing countries, impacts, Kenya

1. Introduction and research objective

This paper explores alternative conceptualizations of the eGovernment artifact relevant to African developing countries. eGovernment, as a concept primarily involving the use of information and communications technologies (ICTs), has partly been spurred by a trend where many governments have been reforming their public sector in order to meet the aspirations of their citizens. eGovernment is generally regarded as a way of providing government services electronically, usually by relying on the Internet infrastructure to reduce the physical character of customer transactions (Calista and Melitsksi 2007; Esteves, Rhoda and Josheph 2008) or by using Internet-based applications to enhance government functionality (Ladner, Petry and McGreedy 2008).

This paper presents the analysis and findings of a survey aimed at capturing the perceptions of meso-level (i.e. regional) government employees and consultants involved in implementation of eGovernment. The survey had two main constructs: the conceptualization of eGovernment and the expected impacts of eGovernment. The overall goal of the paper is to explore the relationship between eGovernment conceptualization and its impacts. The schematic diagram below (Figure 1) captures the envisaged relationships of eGovernment views and impacts.

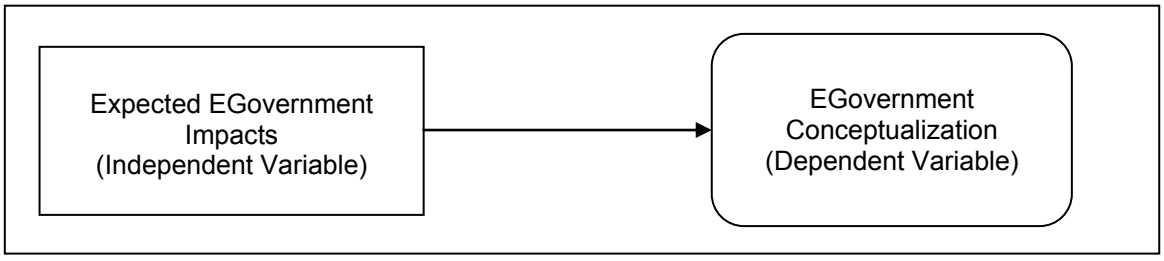

Figure 1: Hypothesized relationship between conceptualization and impacts

Expected eGovernment impacts are hypothesized to influence how eGovernment is conceptualized by the relevant stakeholders such as policy makers, decision makers, consultants and implementers. The argument for the hypothesis that eGovernment conceptualization is influenced by the expected impacts, can be explained from the literature on technology transfer. As developing countries 'receive'

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eGovernment technology or assistance from developed nations, the expected impacts are already known and its assimilation in local conditions is conceptualized with the full knowledge of its expected impacts. Thus the claim is that conceptualization of eGovernment in developing countries can be explained by the expected impacts envisaged by the various supra-national organizations, other developed nations and developing nations viewed by the recipient country as being more developed. EGovernment, as an artifact of human conception, is premised on the relationship that developing countries 'know' the expected impacts of eGovernment before its technologies are patterned in a particular way to realize these impacts.

Analysis was undertaken on the two constructs of conceptualization and impacts of eGovernment to achieve the following objectives:

- Identification of latent factors that are not easily observable in the large sets of variables for conceptualizations and impacts.
- Using these latent variables for subsequent canonical analysis to identify eGovernment impacts which explain eGovernment conceptualization in a developing country.

The contribution of this paper is thus two-fold. Firstly, it proposes an explanatory model that links expected impacts as a possible predictor to how eGovernment is conceptualized in developing countries. This is in line with the agenda of understanding the emerging nature of the eGovernment artifact in developing countries. The implications may be critical in ensuring success of eGovernment projects in developing, especially given that eGovernment projects mostly fail in developing countries (Heeks 2002). The success of eGovernment initiatives should be partly hinged on the nature of this relationship between expected impacts and conceptualization since the knowledge will help in illuminating the phenomenon of eGovernment, as a technology artifact. Thus the postulation of the expected impacts has implications in terms of how, as a concept, eGovernment is operationalized by the implementers. It is felt that the main contribution of this paper lies indeed in highlighting the fact that the implementation of western information technologies in developing countries is shaped by how their impacts are perceived – or at least that there is a strong correlation between the conceptualization and the (expected) impacts. Thus both purveyors of the technologies and researchers can be made aware that, because of the very different expectations and contexts, these technologies may be conceptualized differently than in developed countries.

A second contribution is that it provides empirically derived factors or categories which can be seen to constitute both expected eGovernment impacts as well as how eGovernment is conceptualized in a developing country. Although the factors are based on a relatively small sample, the sample actually represents more than half of the decision makers and implementers in Kenya. Thus, although the factors which are presented in this paper may not be applicable to other countries, the paper does demonstrate a case study example of a practical research approach which uncovers this type of conceptualizations more explicitly.

2. Theoretical background and informing literature

This paper argues that eGovernment, as an artifact of human conception, remains relatively poorly developed at the levels of theory, methodologies and practice. The investigation is focused on two problematic areas of eGovernment: its conceptualization and operationalization as an artifact. The research problem is premised on the foreignness and vagueness of the concept of eGovernment as a Western import into African countries and recommended as an instrument for achieving governance reforms (Heeks 2002; Heeks and Bailur 2007). The global and national institutionalization or objectification of eGovernment has been taking place since the mid-1990s which has resulted in various stage models (UN 2008). Its shaping has been influenced by individual researchers or proposed by institutions. Some of the cornerstone publications shaping the initial eGovernment discourse were Gartner's Four Phases of eGovernment Model (Baum and Di Maio 2000), the Global Survey of eGovernment (UN 2003) and Layne and Lee (2001)'s four-stage model for developing a fully functional eGovernment.

A number of prominent IS researchers (Alter 2003; Benbasat and Zmud 2003; Myers 2003) have drawn attention to the importance of conceptualizing the Information Technology (IT) artifact as a core research consideration of the Information Systems discipline. Orlikowski and Iacono (2001), while emphasizing the need for the centrality of the IT artifact in IS, pointed out that academics in the field have not deeply pursued the IT artifact as the core subject matter. Thus the *conceptualization of eGovernment* is a critical consideration for understanding its role in a developing world context. The

theoretical framework used in this research rests on five constructs to be used as a basis for eGovernment conceptualization. The five constructs were based on a summary of the predominant IT artifact conceptualizations (or views) proposed by Orlikowski & Iacono (2001); Sein & Harindranath (2004) as well as Sawyer (2002). These five conceptualizations are the tool view, proxy view, ensemble view, nominal view and computational view. The tool or feature view sees any information technology and, by extension, eGovernment, primarily as a social relations tool, a labor substitution tool, a productivity tool and/or and information processing tool. The proxy view, by contrasts, views technology as perception, diffusion and/or capital. The ensemble or functional view approaches technology as a development project, a production network, embedded systems or a structure. The nominal view sees technology as absent in that it cannot be theorized or conceptualized. Finally, the computational or proof of concept view sees technology as an algorithm or model.

EGovernment, as a technology-based artifact for the transformation of public service delivery, needed to be addressed from a specific perspective to assess the influence of *expected impacts* on its conceptualization. Whilst it would have been desirable to uncover the actual impacts of the eGovernment initiatives, this was impractical since implementation of this broad based strategy is still at a very nascent stage in the period 2005-2008. The appropriate respite was to consider the perceptions of the intended impacts of the stakeholders of these eGovernment initiatives. This called for a consideration of frameworks that aid in understanding or studying the intended actions and expected impacts of the eGovernment artifact. One of the most recent and relevant eGovernment impact measurement models was that developed by Chrissafis (2005) used in the analysis of the efforts OECD eGovernment initiatives.

Chrissafis (2005) postulates that key objectives that lead to the attainment of GDP growth are those of a desire for better connected public service delivery system (connectivity) and a better functioning public functioning system (efficiency). The *connectivity* objective is conclusively achieved when there are cost savings in infrastructure investments; ICT industry output growth and better opportunity outcomes for citizens. On the other hand, *efficiency* is attained when there are overall cost savings, optimization of government revenues and the achievement of organizational efficiencies. Socio-economic cohesion, as a general construct, is driven by the desire of governments to attain *effectiveness* through better services and opportunities for its citizenry (Chrissafis, 2005). This can be operationalized through the outcomes of increased user value and satisfaction; better opportunities outcomes for citizens; improved business environment and improved business opportunities. Another expected outcome of eGovernment initiatives is the improvement of democratic processes within a country, with its overriding objective being the attainment of openness through good governance. *Openness* in governance is attainable via the constructs of transparency and accountability; openness and participation as well as a better cooperating public administration system (Chrissafis, 2005).

In summary, the study partly draws on the technology artifact perspectives outlined, since it provides a peek into the essence (conceptual form of eGovernment) and the impacts associated with the artifact. For developing countries that rely on technological transfer, the choices are limited since the influence may be from benchmarks that are already established by organizations such as the UN, or other countries that have leverage in one way or another. For instance, in the eGovernment Strategy of Kenya, there is explicit mention of benchmarking with countries such as South Africa, Singapore, Britain and Canada (GOK-EGS 2004). Thus the conceptualization of eGovernment programs does not take place in a vacuum in which expected impacts are not known. Conceptualization is therefore theorized to be dependent on impacts, with diffusion factors possibly mediating or moderating this relationship.

3. Methodology

3.1 Key constructs

The eGovernment Conceptualization and Impacts items were selected from literature on Information Technology conceptualization and technology impacts literature. The *conceptualization* items were placed in five main categories: *tool view; proxy view; ensemble view; computational view* and *nominal view*. There were a total of 32 items measuring conceptualization. The *eGovernment Impacts* items were placed under four main systemic objectives of achieving *Effectiveness, Efficiency, Connectivity* or *Openness* in governance (Chrissafis 2005). There were a total of 41 items measuring

eGovernment impacts. All the measures were based on a 5-point Likert scale with (1) "strongly agree" and (5) "strongly agree" as the anchors.

Table 1: Constructs, test items and references

Conceptualization Constructs	No. of items	References
Tool View	10	Sein, M.K., & Harindranath, G., 2004; Orlikowski, W.J., & Iacono, C.S., 2001
Proxy View	11	
Ensemble View	5	
Computational View	3	
Nominal View	3	
Impact Constructs	No. of items	Reference
Connectivity	8	Chrissafis, T., 2005
Openness	10	
Efficiency	14	
Effectiveness	9	

Although the test items were sourced from instruments used in prior research (as per table 1), the instrument was still piloted among 10 IT professionals and minor corrections for purposes of clarification and better language use were done.

3.2 Sampling approach

A census approach was taken and thus the sampling frame consisted of *all* Kenyan government ministries and parastatals deemed to be engaged in eGovernment, as well as all major consulting firms involved in eGovernment systems. A list of 147 agencies was created, sourced from the Computer Society of Kenya (CSK) database and the Government of Kenya (GOK). After telephonic follow-up, usable returns were received from 77 respondents, representing a very high 52% response rate. This very satisfactory response not only testifies to the prominence given to eGovernment in Kenya but also instills confidence in the representativeness of the responses and the generalizability of the findings. There were no missing values since during the collection of the questionnaire since all respondents were guided in filling in the questionnaire.

The final sample consisted of 41 Government agencies (53%) and 36 Consulting firms (47%). The Government agencies were further divided into central government agency (32%) and government parastatals (21%). The majority of the agencies (42%) had over 1000 employees. The respondents were IT/IS Directors, Information Systems Managers, Departmental Heads, consultants and other eGovernment experts identified in the sampling frame.

3.3 Reliability analysis

Reliability analysis was used to assess internal consistency (degree of homogeneity among the items) to identify those items in the questionnaire that had low correlations in order to exclude them from further analysis. This was regarded as an important first step since the survey instrument had not been used before. Landis and Koch's (1977) benchmarks were employed to determine reliability. .

The conceptualization of e-government was theorized to be underpinned by five main views: tool view (tool); proxy view (proxy); ensemble view (ensemble); computational view (computational) and nominal view (nominal). Cronbach alpha coefficients were computed for tool, proxy, ensemble, computational and nominal items in order to identify items that contribute to low internal consistency.

Overall, the original 32 items theorized as indicators of e-government conceptualization reduced to 23 after deletions, resulting in an overall Cronbach alpha coefficient of 0.89, which according to Landis and Koch (1977:168), is "almost perfect". An examination of the 23-item scale revealed that one item linked to computational had a low item-correlation; however, the elimination of this item, or any other item, would not increase the reliability. The 23 items were therefore retained for further analyses since the above results indicated that the items were homogenous. The remaining 23-item scale was therefore factor analyzed to achieve data reduction.

Cronbach alpha coefficients were also computed for the indicators of E-Government impacts (connectivity, efficiency, effectiveness, and openness) items in order to identify those that contribute to low internal consistency. Out of a 41-item scale, only two items were dropped due to low

correlations. The final overall Cronbach's alpha coefficient was 0.95 and average inter-item correlations of 0.32.

4. Uncovering the key factors underlying eGovernment conceptualization and impacts

A factor analysis based on a principal component analysis (PCA) of the two scales for conceptualizations and impacts was conducted to investigate the internal structure as well as to determine the smallest number of factors that could be used to best represent the interrelations among the sets of variables for the two constructs. In deciding on the number of factors to extract, a combination of the Kaiser-Guttmann Rule (K1 rule) and the scree plot were utilized to determine the most appropriate component solution. The K1 rule advocates for retention of those factors with Eigen values of at least 1, while the scree plot considers only those factors that appear before the steep decline ends.

Factors considered significant were based on a criteria proposed in the literature. Comrey and Lee (1992) suggests that the pattern/structures in excess of 0.71 loading are considered excellent, 0.63 as very good, 0.55 as good, 0.45 as fair, and 0.32 to be poor. Hair et al (2006) suggests that there should be due consideration of the sample size when deciding on the threshold for the loadings. According to their guidelines, the ideal factor loading for a study with a sample size of 77 respondents would fall between 0.65 and 0.60. However, given the exploratory nature of this research as well as the use of factor analysis as a heuristic tool in this study, a cutoff of 0.55 could be considered appropriate.

4.1 The conceptualization of eGovernment

The 23-item scale was factor analyzed and the resulting optimal factor solution interpreted. A summated scale was then constructed to form the basis for subsequent canonical analysis. Although seven factors had Eigen values greater than 1, two factors failed to have a sufficient number of items for interpretation purposes. According to Tabachnick and Fidell (2001:622), “factors with a single variable can be described as poorly defined. Factors with two variables should be highly correlated with each other as in > .70”. Thus only five factors were retained with a total explained variance of 61%.

Table 5 (in appendix) presents the items, the factor loadings and the names that were given the factors. The naming of the factors took into account the significance of the loadings. Three items were therefore deleted from further analysis, while five factors, representing 61% of the explained variance were retained; resulting in a 19-item inventory. These new, empirically derived factors (measured by the new summated scales) are summarized in table 2 below, along with their internal reliability as measured by the Cronback Alpha coefficient.

Table 2: Replacement of original conceptualization variables with empirically derived factors

Components of EGovernment Conceptualization	Summated Scale Mean	Cronbach Alpha
Factor 1: Network Diffusion View (NDV)	3.9	0.782
Factor 2: Service Delivery View (SDV)	3.93	0.679
Factor 3: Extensive Value Network (EVN)	3.43	0.835
Factor 4: Network Restructuring Device(NRD)	4.23	0.567
Factor 5: Evolving Actor Network (EAN)	3.76	0.738

In naming ***factor 1***, *Network Diffusion View (NDV),* cognizance of the four Proxy View items as opposed to one Tool View item is considered. Out of the four Proxy View items, three are orientated towards diffusion of technologies as surrogate to eGovernment conceptualization. *Network* connotation refers to the critical mass of actors, identified as human stakeholders in development projects as well as other alliances such as with various industries, technologies and other nations. The *Diffusion* metaphor relates to the surrogate perspective, where the success of a project conceived by the network of stakeholders, can only be visible from its spread in a particular context in various forms (as a technology, applications, perceptions, etc).

Factor 2 was named *Service Delivery View (SDV)* with a total explained variance of 11%. The tool view perspective is captured through the inscription of technical features in relevant technologies,

while improved service delivery is possible through superior computational power of eGovernment technologies. While service delivery is possible based on the engineered artifact and superior computational capabilities, its realization is only possible when the artifact is used, as demonstrated from the proxy perspective. Naming of Factor 2 therefore derives from the tool view and the computational view perspectives due the high loadings of their items.

Factor 3 was named *Extensive Value Network* (EVN) with a total explained variance of 6% with all the loadings derived from various proxy perspectives. Two statements espoused the conceptualization of *Technology as Capital*. A third statement exposed the *Technology as Diffusion* perspective. Factor 3 is therefore a Proxy View of eGovernment with a strong' leaning towards Technology as Capital and Diffusion. In naming the factor, the influential perspective was the Technology as Capital Perspective with recognition that a positive change in IT expenditure being critical in enhancing or extending the value accruing to the network of users.

Factor 4, with an explained variance of 6% was named *Network Restructuring Device (NRD)* and was significantly loaded with two tool view items**.** The Tool View of Technology regards it as an engineered artifact, expected to do what its designers intended it to do. The tool view statements that were heavily loaded on the factor highlight eGovernment as a device for augmenting labor productivity.

Factor 5, with an explained variance of 5% was named *Evolving Actor-Network (EAN)*. It depicts an ensemble perspective of eGovernment where the role of stakeholders is critically elevated (as a development project and production network) in implementing technologies in a particular context (embedded system). As a development project, eGovernment captures the roles of a multiplicity of actors, thus elevating stakeholder roles which continuously evolve.

4.2 The expected impacts of eGovernment

The 40-item scale was factor analyzed using a Principal Components extraction method with Varimax rotation and Kaiser Normalization. A four-factor model appeared to be the optimal and had significant loadings of the items in each of the four factors, even after accounting for cross-loadings items.

Table 6 in the appendix lists the items, the factor loadings and suggested factor labels as summarized in Table 3 below. The interpretation of the factors based on their significant loadings is discussed below.

Table 3: Replacement of original impact variables with empirically derived factors

Components of Expected EGovernment Impacts	Summated Scale Mean	Cronbach Alpha
Factor 1: Enhanced Interactions and Accessibility (EIA)	4.125	0.89
Factor 2: Enhanced Co-operation and Awareness (ECA)	4.022	0.89
Factor 3: Better Connected Public Administration (CPA)	4.056	0.88
Factor 4: Enhanced Citizen Opportunities (ECO)	4.052	0.76

Factor 1, with a high explained variance of 33% was named *Enhanced Interactions and Accessibility (EIA)*. The variables capture a number of themes: increased interaction with the public at large (OPENNESS); increased business opportunities (EFFECTIVENESS); back office effect of organizational efficiency (EFFICIENCY). OPENNESS is implicit in the word interaction, opportunities is captured by the effectiveness item, while organizational efficiency by the efficiency items. Therefore, an expected impact of eGovernment is to enhance its interactions through electronic means. This would result in organizational efficiencies and accessibility of the government by businesses (especially the SMEs).

Factor 2 was named *Enhanced Co-operation and Awareness (ECA)* and explained an additional 11% of the variance. The variables emphasize enhanced rule of law by making legislation available online and enhanced co-operation (OPENNESS). Enhanced rule of law and enhanced co-operation are considered as inter-mediate outcomes for good governance (Chrissafis, 2005), thus these three highly loading variables emphasize aspects of good governance by increasing accessibility to better information to enhance the rule of law. Given the high loadings of the first four factors, the influence of the remaining two variables was considered insignificant.

Factor 3, with an explained variance of 8%, was named *Better Connected Public Administration (CPA)* and had predominantly CONNECTIVITY items. The three variables that were considered critical in naming the factor due to their high loadings of over 70% captured the notion that a better connected public administration arises from increased outputs from the ICT industry in terms of better services, terms and innovations. This point to the need for a certain level of critical mass to be reached in terms of services and products accessible by the government from its ICT industry. Further, a better connected public administration is visible when there is a reduction in administrative inter-connection costs amongst agencies as well as reduced administrative costs of procurement.

Factor 4, named *Enhanced Citizen Opportunities (ECO)*, had an explained variance of 6% with two significant items loading (EFFECTIVENESS). The expected impact arises from better opportunities for citizens in terms of better life expectancies from improved health information, improved public schooling opportunities, access to better job information and increased accessibility to the citizens. The items therefore capture improved capabilities of the government and the citizens.

5. Exploring the link between conceptualization and impact

The 4-item summated scale for impacts and the 5-item summated scale for conceptualizations were then used to analyze their association using canonical correlation analysis (CCA). The 4 impact factors (Enhanced Interactions and Accessibility (EIA); Enhanced Co-operation and Awareness (ECA); Better Connected Public Administration (CPA); Enhanced Citizen Opportunities (ECO) were designated as the set of multiple independent variables. The 5 conceptualization factors (Network Diffusion View (NDV); Service Delivery View (SDV); Extensive Value Network (EVN); Network Restructuring Device (NRD); Evolving Actor-Network (EAN) were considered as the multiple dependent variables. The statistical problem involves identifying any latent relationships between the respondents' perceptions about eGovernment impacts and the measures of eGovernment conceptualization. The analysis in this study provides evidence linking conceptualization and impacts. The CCA process is discussed in the sections below.

5.1 Multivariate significance test

A canonical correlation analysis (CCA) of the data (Table 4) shows 10 significant correlation coefficients level of significance of 0.05, widely accepted as an appropriate level of significance (Hair et al, 2006). The coefficients show some relationships between eGovernment conceptualization and the expected impacts. For instance, one may conclude that some 17% (0.41^2 coefficients of NDV and CPA) of the variance is the view that eGovernment, conceptualized from a Network Diffusion View (NDV), is influenced by the need to have a better Connected Public Administration (CPA).

Table 4: Canonical correlations

Correlation coefficient	EIA	RLA	CPA	ECO
NDV	0.34	0.06	0.41	0.03
SDV	0.31	0.26	0.22	0.25
EVN	0.44	0.13	0.31	0.23
NRD	0.31	0.14	0.30	0.11
EAN	0.60	0.20	0.52	-0.08

Likewise, 36% (0.60^2 coefficient of EAN and EIA) of the variance is the view that conceptualizing eGovernment as an Evolving Actor-Network (EAN) is influenced by the expected impacts of Enhanced Interactions and Accessibility (EIA) of the civil service and citizens. However, adopting an interpretation based solely on pair wise correlations is not very persuasive. Thus a CCA analysis was undertaken in order to identify any latent relationships between the multiple dependent and multiple independent variables.

5.2 Canonical function analysis

Table 5 presents relevant details of the canonical analysis showing the loadings of the variables, variance extracted, redundancy indices, significance levels, and canonical roots for the variables. The number of functions produced from a canonical analysis is equivalent to the lower of the two sets of dependent and independent variables. There were only four e-government conceptualization measures as opposed to five expected e-government impacts measures. Therefore, the four

canonical functions (CF1 to CF4) extracted are assumed to capture all the correlation between the sets of the dependent and independent variables.

Table 5: Summary statistics for the canonical correlation analysis

Criterion Variables	CF1	CF2	CF3	CF4
Network Diffusion View (NDV)	-0.599993	-0.021694	-0.572066	0.501559
Service Delivery View (SDV)	-0.405483	0.653821	0.124453	0.589810
Extensive Value Network (EVN)	-0.599143	0.597250	-0.439514	-0.231904
Network Restructuring Device (NRD)	-0.482742	0.252583	-0.194311	0.474478
Evolving Actor-Network (EAN)	-0.944446	-0.203310	0.150745	-0.155929
Variance Extracted (VEI)	0.401680	0.177958	0.119280	0.180532
Redundancy	0.211018	0.024969	0.008385	0.003370
Predictor Variables				
Enhanced Interactions and Accessibility (EIA)	-0.892517	0.271035	0.189789	-0.306487
Enhanced Rule of Law Awareness (ECA)	-0.317441	0.410687	0.713341	0.470862
Better Connected Public Administration (CPA)	-0.770092	-0.181605	-0.249686	0.558242
Enhanced Citizen Opportunities (ECO)	-0.002319	0.975493	-0.170178	0.139451
Variance Extracted (VEI)	0.372601	0.306673	0.159045	0.161682
Redundancy	0.195742	0.043028	0.011180	0.003018
Canonical R	0.724803	0.374576	0.265128	0.136635
Canonical Root Square	0.525339	0.140307	0.070293	0.018669
Chi Square Value	70.15266	17.24673	6.51293	1.33804
Degrees of Freedom	20	12	6	2
Level of Significance	0.000000	0.140619	0.368270	0.512218

Although the canonical analysis produced four canonical functions from the data, Bartlett's Chi Square test of significance showed that only one function namely CF1 was statistically significant. In what follows, this first canonical function is discussed in most detail.

The ranking of the selected variables (where importance is determined by the absolute value of the canonical loadings) for the expected impacts of eGovernment variables contributing to the first canonical function is enhanced interactions and accessibility (EIA), better connected public administration (CPA), and enhanced co-operation and awareness (ECA). Similarly, the rank order of importance for the eGovernment conceptualization variables contributing to the first canonical function is evolving actor network view (EAN), network diffusion view (NDV), extended value network (EVN) view, network restructuring device view (NRD), and service delivery view (SDV).

The canonical function suggests that the expected impacts of eGovernment are significantly and positively correlated with eGovernment conceptualizations since all the loadings have the same signs. Under the dependent variable set of conceptualization, the first function (under L1) has three significant loadings of the *Evolving Actor-Network* (EAN), *Network Diffusion View* (NDV) and *Extended Value Network* (EVN) view at 94%, 60% and 60% respectively. The expected eGovernment impacts that influence these views are *Enhanced Interactions and Accessibility* (EIA) and a Better *Connected Public Administration* which had loadings of 89% and 77% respectively. These two predictors, as a set, can be used to explain the explained variance for the three criterion variables which load significantly. The variables in the predictor set are directly related to the relevant criterion variables as evidenced from the signs of the canonical loadings. This relationship is captured in Figure 2.

Interestingly, although the second canonical function L2 is not statistically significant (p=0.14), it captures much of the remaining conceptualization. There is a very strong suggestive interpretation

that e-government conceptualizations of Service Delivery View (SDV) and Extended Value Network (EVN) are individually correlated to the expected e-government impacts of Enhanced Citizen Opportunities (ECO) and, to a much lesser extent, Enhanced Cooperation and Awareness (ECA) as a set.

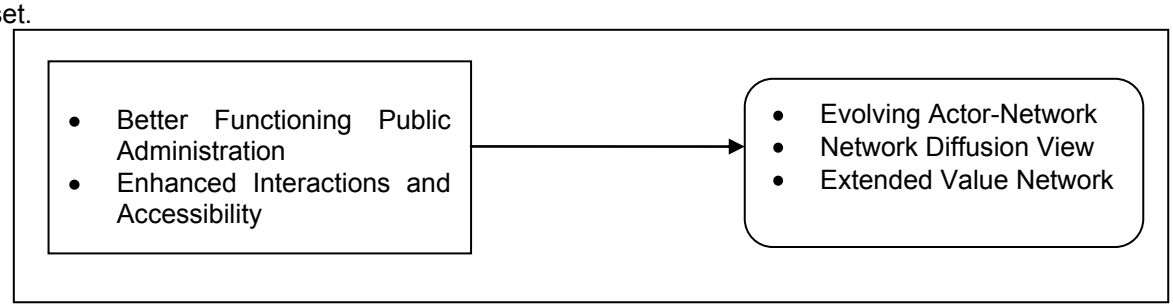

Figure 2: Relationships as exhibited through the canonical function

5.3 Discussion: The connected government and the eGovernment artefact (CF1)

According to the canonical function, the expected eGovernment impacts of enhanced interactions and accessibility (EIA) as well as the expectation of a better connected public administration (CPA) is directly and significantly related to eGovernment conceptualizations revolving around the evolving actor-network view (EAN), the network diffusion view (NDV) and the extended value network (EVN). The impact of CPA, which was significantly loaded with 8 items in the factor analysis, and a canonical loading of 89%, can be interpreted to be strongly linked to the quest for *good governance* by ensuring more openness and participation (thus facilitating interactions) through online forums and consultations (Chrissafis, 2005).

The canonical function also had EIA with an explained variance of 33% from factor analysis and the highest canonical function loading of 89%; the other significant loading of CPA had an explained variance of 8% and a canonical loading of 77%. From the factor analysis, EIA highlighted the impact of eGovernment in terms of encouraging online interactions as well as enhancing accessibility to government services. Increased interactions with the public can also be linked to the objective of enhancing *good governance* (Chrissafis, 2005). This is achieved by creating an environment of more openness and participation in governmental affairs, through for instance online forums and consultations. However for interactions to be enhanced, whether based online or not, there are certain efficiencies that should be realized. The EIA factor captured a number of these, such as the need to optimize the flow of resources within and among' government agencies, reducing internal costs through efficient management of resources across government agencies; and aggregating demand to avoid redundant services. The *back office effect* of these efficiencies enables the government to be more effective in service delivery (for instance by becoming more accessible to its target constituents).

The other composite impact of eGovernment reflected through the canonical function is that of having a *Better Connected Public Administration* (CPA). The factor analysis showed that six out of eight of the items that loaded significantly emphasized the themes of improved communications, integrating diverse databases, one-stop-shop perspective to whole government applications development as well as a special focus on encouraging investments in human resources and software. Like EIA, which highlighted the need for achievement of certain efficiencies, CPA would help in realizing cost savings arising from a more *connected* and *integrated* public administration.

What emerges from the composite construct as reflected in canonical function is that the EIA factor emphasizes the need for *good governance*. CPA on the other hand, captured the need for improving *connectivity and greater integration* among public agencies. These two (EIA, CPA) can be considered as formative constructs reflecting an internal orientation of expected impacts that can be captured by the theme of *connected government.* This is derived from an ICT-based approach to governance aimed at improved co-operation between government agencies and allows for active and effective consultation with various stakeholders (UN, 2008).

5.4 Discussion: Value addition and the technical artefact (CF2)

Although the second canonical function is not statistically significant (p=0.14), it is strongly suggestive of a second relationship since it includes most of the remaining factors not captured in CF1 and therefore invites further exploration.

CF 2 has a very strong loading of Enhanced Citizen Capabilities (ECC) with a canonical loading of 98%; and a still high loading of 41% by Improved Co-operation and Awareness (ICA). As an expected impact of e-government, ECC features improved schooling prospects through e-learning alternatives; as well as access to more and better jobs opportunities. The expectation from the adoption of e-government is that the citizenry shall have better opportunity outcomes available, which if they take up, their capabilities are enhanced. While the focus seem to be on the opportunities for learning, the formative construct of ECC also implies that the impact can be extended to other opportunities such as improving the life expectancy of citizens for instance by providing medical information online (Chrissafis, 2005). Thus the overall orientation of ECC is the effectiveness of e-government in providing opportunities for its citizens. ICA on the other hand is characterized by quality and amount of communication provided to enhance the daily usage of information from government agencies, as well as to improve the diffusion of information on rights and regulation. The tentative interpretation adopted is that providing alternatives to citizens, in terms of added opportunities cannot be divorced from the goal of a citizen-centric concept of good governance. CF2 shows that an expected impact of e-government focuses on adding value to citizens interaction with government agencies by availing more opportunities. Value-Addition can therefore arguably be used as a formative construct representing the measures of ECC and ICA. Value-Addition captures the objectives of achieving effectiveness in service delivery to citizens as well as fostering more openness and participation of the citizens.

In respect of the dependent variables, the critical loadings of the SDV factor analysis were conceptualizations featuring performance capabilities arising from the technologies of e-government and the computational power of ICT engineered for public service delivery. Thus SDV captures two conceptualizations of technology relevant to the e-government artifact: E-Government as a productivity tool and as an algorithm. The EVN perspective further builds on the proxy view: its perception as a capital investment with measures such as financial resources spent on e-government technologies as well as the return on investment of these technologies over time. Overall, CF2, with EVN and SDV appear to elevate the role of technologies of e-government in terms of technical capabilities or being able to delineate the value arising from investments in these technologies. What may be implied in these conceptualizations, as a composite, is that the technology artifact of e-government is separable and therefore it is possible to focus on specific capabilities, features and measures of value. Thus overall, the composite theme of the criterion variables in canonical function two is that of a technical artifact, capable of enhancing service options, beyond the normally received view.

Thus from the second canonical function, the dependent variable set reflects a view of the conceptualization of e-government from a tool and computational view perspective by elevating the technical capabilities of ICTs and their role in creating added value to users (citizens) of government services. Both the EVN and SDV, as a set, focus on e-government as a technical artifact which is strongly influenced by the composite formative construct of Value-Addition to government service. This conceptualization (or views) of e-government is can be said to be orientated towards achieving an external impact or has a demand focus towards citizens. However, given the lack of statistical significance, it must be noted that this interpretation remains tentative and subject to validation by future research.

6. Summary and conclusions

This study was premised on the notion that developing countries are net importers of technology: they have minimal influence in the design of these technologies and the impacts expected from them. This is also the case with eGovernment, which is reliant on a number of ICTs imported into the developing countries. The starting point was therefore to theorize the relationship between the expected impacts of eGovernment and how they relate to eGovernment conceptualization by implementers at the regional government level.

Firstly, the factors or components making up both conceptualization and expected impact categories were derived empirically using exploratory factor analysis. Even though the survey instrument was based on validated instruments from prior literature, it was found that the latent factors which were eventually uncovered did not map very well on the factors originally postulated in the literature. In particular, the expected impacts of EGovernment were found to fall into four major clusters, tentatively named termed Enhanced Interactions and Accessibility (EIA); Enhanced Co-operation and Awareness (ECA); Better Connected Public Administration (CPA) and Enhanced Citizen Opportunities (ECO); thus replacing the initially postulated connectivity, openness, efficiency and effectiveness. The way eGovernment was conceptualized was initially postulated to be categorized as a tool view; proxy view; ensemble view; computational view and nominal view. However, the empirical data suggest a somewhat different set of categories, under the following five views (our terms): Network Diffusion View (NDV); Service Delivery View (SDV); Extensive Value Network (EVN); Network Restructuring Device (NRD); and as an Evolving Actor Network (EAN). It must be noted that the link between the originally postulated factors as found in the literature and the ones uncovered from the empirically grounded factor analysis is quite strong and there is considerable overlap, both between the impact factors and the possible views. However, it appears that the "new" factors are more specific and a refinement within the context of eGovernment. The canonical correlation analysis was then undertaken using the newly found factors. This analysis showed a significant and unambiguous association between the impact and conceptualization factors. This empirical study has therefore provided insight into the concept of *connected government* by linking it to the set of eGovernment conceptualizations of the Evolving Actor-Network (EAN; with a loading of 94%), Network Diffusion (NDV; 60%) and Enhanced Value Network views (EVN; 60%). The EAN primarily reflects an *ensemble view* of eGovernment, specificatlly characterized as a socio-political process influenced by the roles of a network of stakeholders in a particular context. Thus as a concept dependent on particular technologies, eGovernment conceptualization relies on stakeholder roles and interests and how they manage their relationships as well as the contextual conditions specific to a country or even an individual government agency in which it is appropriated. Significantly, the factor analysis captured the predominant view oriented towards its conceptualizations as an *artifact in formation* or as a *development project*, where the focus is on the roles of stakeholders and their influence in the social processes (Orlikowski and Iacono 2001).

It was also highlighted in the factor analysis that the NDV, with the highest explained variance of 31%, was heavily orientated towards viewing the conceptualization of eGovernment as surrogate to a critical mass of people, industries, and nations adopting certain technologies. For instance, the extent of diffusion of Internet would be viewed as such a *proxy view*, where, based on numbers that have adopted it, the perception of large numbers of Internet users is viewed as evidence of its adoption. This perception of *critical mass of actors* (people, industries, nations, technologies) is indicative of eGovernment conceptualization. In summing up the insight emerging from the canonical function, the dependent variable set reflects a view of the conceptualization of eGovernment from a *proxy* and an *ensemble* perspective by elevating the role of the critical mass of the network of actors involved in its development as an artifact that evolves over time. Both the EAN and the NDV, as a set, focus on eGovernment as an *evolving artifact* defined by *a critical mass* of a *network of actors*. This conceptualization is strongly associated with the perception that adopting eGovernment results in a *connected government*. Thus, at the very least, it can be said that *connected government*, significantly influence the conceptualization of eGovernment as an *evolving artifact*. This conceptualization (or views) of is evidently geared towards achieving an internal impact (*back office effects*) (UN 2008). This view of eGovernment partly captures the vision of Kenya to be part of the knowledge society (a largely Western concept) with the assumption that the extant computing platform is adequate. However, this assumption is not tenable in the current African situation, and evidently, the ethos of a knowledge society is not captured from what emerges in this study. The concern of eGovernment implementers is predominantly a *supply-side focus*, evidently pointing to less priority on programs that can foster more inclusion of other stakeholders. The elevation of the supply-side (back office effects) finds traction from the canonical function.

Two consequences of a supply-side focus on eGovernment are offered: from an *ensemble view* as well as from a *proxy view* conceptualization of eGovernment. The ensemble view brings out the perception that eGovernment remains an *artifact-in-formation*, critically dependent on the roles of various stakeholders. The proxy view reveal that eGovernment is a *surrogate* for achieving *internal automation* of the internal systems in order to realize bureaucratic efficiency through greater access to information, automation of routine operations, and systems integration (Calista *et al* 2007). The notion

of *artifact-in-formation* discounts notions of a monolithic technological 'black box' since the nature of eGovernment is dependent on evolving stakeholder relationships. This is in conflict with dominant evolutionary approaches that 'back boxes' eGovernment maturity through various stages: instead its conceptualization appears to be linked to how to manage stakeholder dynamics.

The second consequence stems from the surrogate perspective which elevates eGovernment as a galvanizing metaphor for attaining *internal automation* for bureaucratic efficiency. This is again conflictual to ideas, practices and visions of eGovernment that appear to elevate greater inclusiveness of the eGovernment by the designers (Calista *et al* 2007). So while the eGovernment visions appear favorable to citizen participation and inclusiveness in government affairs, the meso-level perceptions of implementers has an emphatic internal focus of achieving automation of internal processes. A number of limitations must be recognized. Firstly, the sample size is relatively small (n= 77). Because the sample represents more than half of the 147 Kenyan government agencies and eGovernment consultancies involved in eGovernment, the responses can be assumed to reflect the status quo in Kenya. However, the statistical support for the proposed constructs is not as strong. There is no evidence for the generalisability of the specific findings in terms of factors uncovered to other developing countries where the context may be very different. Secondly, although a theoretical rationale is given for the theoretical model whereby expected impacts are hypothesized to exert an impact on eGovernment conceptualization and not vice versa, it must be recognized that, from a statistical point of view, the support is only for correlation (or association) between the factors as highlighted and the directionality cannot be substantiated. Future research is vital. Firstly, it is imperative that the newly uncovered factors for both eGovernment impacts as well as eGovernment conceptualization are validated in other developing country contexts. Secondly, it will be interesting to see whether the same linkages exist between the factors as was the case in Kenya. Thirdly, it would be useful to find alternative models or taxonomies (and associated empirical instruments) to measure 'technology conceptualizations' empirically.

7. Appendix 1: Factor compositions and loadings

Table 6: Factor matrix for eGovernment conceptualizations and proposed Factor Names

Variables	Loadings
Factor 1: Network Diffusion View	
Proxy View: Experienced Barriers	(0.71)
Proxy View: Spread of Technology	0.63
Tool View: Cheap and Efficient Enabler	0.61
Proxy View: Critical Mass Required	0.60
Proxy View: Resource Availability	0.56
Computational View: Integrated Database Technology	0.56
Factor 2: Service Delivery Tool	
Tool View: Technical Enable Performance	0.76
Computational View: Computational Power	0.75
Proxy View: Ease of Use	0.56
Factor 3: Extensive Value Network	
Proxy View: Change in IT Spend	0.85
Proxy View: Numbers Using Technology	0.72
Proxy View: Financial Resources Spent	(0.77)
Factor 5: Network Restructuring Device	
Tool View: Enhance Worker Capabilities	0.72
Tool View: Administrative Restructuring Tool	0.70
Factor 6: Evolving Actor-Network	
Ensemble View: Complex Socio-Political Process	(0.77)
Ensemble View: Network of Stakeholders	0.71
Ensemble View: Social Influences	0.66
Ensemble View: Integration & Engagement of Users	0.51
Tool View: Repository of Information	0.50

Table 7: Varimax-rotated component analysis factor matrix for eGovernment impacts

Variables	
Factor 1: Enhanced Interactions and Accessibility	Loadings
OPENNESS: results in increased interaction due to the online forums available for public usage	0.79
EFFECTIVENESS: ensures an increase in the accessibility of public procurement opportunities to SMEs	0.72
EFFICIENCY: adoption leads to an increase of the productivity of public employees in terms of hours worked	0.69
EFFICIENCY: adoption leads to a decrease in the number of cross-agency managed files resulting in the decrease of internal costs of processes	0.69
EFFICIENCY: adoption leads to improved organizational and governmental efficiency due to a decrease of percentage of resources released for internal processes	0.68
EFFECTIVENESS: results in reduced administrative burden for businesses	0.67
EFFICIENCY: The level of demand aggregation increases from E-Government adoption	0.63
OPENNESS: adoption results in a general increase in online consultation	0.60
Factor 2: Enhanced Co-operation and Awareness	
OPENNESS: Enhanced cooperation from increased daily usage of cross-agency networks	0.81
OPENNESS: Regulatory agencies make information available online	0.74
OPENNESS: Enhanced quality and volume of interaction in various government levels	0.74
OPENNESS: Increased percentage of Legislation Online	0.67
CONNECTIVITY: adoption results in improved inter-administrative integration resulting in general cost savings	0.64
EFFICIENCY: results in better targeting of services to various sectors	0.61
EFFICIENCY: adoption is visible in the dollar increase of revenues due to collections from new premium services such as e-commerce/e-business	0.58
OPENNESS: adoption results in increased digitalization of data which enables organizational charts and contact information be available online	0.58
Factor 3: Better Connected Public Administration	
CONNECTIVITY: leads to ICT output growth due to increased human capital investments	0.78
CONNECTIVITY: adoption leads to improved communication between various administrative units resulting in reduced inter-connectiveness costs	0.71
EFFICIENCY: adoption leads to a percentage reduction in administrative costs of procurement of goods and services	0.71
CONNECTIVITY: leads to a single-approach to applications development within the government sector	0.67
EFFICIENCY: adoption leads to a reduced number of internal transactions in government	0.64
CONNECTIVITY: leads to a one stop-shop approach to handling within government departments/organization and country	0.61
CONNECTIVITY: adoption leads to ICT output growth due to increased software investments	0.60
CONNECTIVITY: adoption of E-Government leads to the reduction of costs as a result of integration of the diverse distributed databases	0.58
EFFICIENCY: adoption leads to a percentage reduction of data processing costs	0.57
Factor 4: Enhanced Citizen Opportunities	
EFFECTIVENESS: adoption leads to increased access to public e-learning resources	0.79
EFFECTIVENESS: adoption leads to an increased ease of access to job information for public institutions	0.70
EFFICIENCY: adoption results in a percentage increase in constituent coverage	0.62
OPENNESS: adoption results in increased clarity of taxation information	0.62
EFFECTIVENESS: adoption leads to considerable ease of enrolment at educational institutions	0.61

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