Asian Journal of Information Management

ISSN 1819-334X

Academic Journals Inc.

www.academicjournals.com

Asian Journal of Information Management 4 (1): 1-11, 2010
ISSN 1819-334X

A Model for eGovernance System Implementation for Developing Countries

M.C. Okoronkwo
Department of Computer Science, University of Nigeria Nsukka, Nigeria

Abstract: A model for adopting IT (Information Technology) facilitated governance based on management paradigm is presented in this study. The objective is to facilitate the process of implementing IT services within the context of a state. The model which is conceptual in nature is based on empirical results from the studies carried out in Enugu State. It was constructed from requirements put together by the user communities in the state and integrated with concepts of the management paradigm. It drew from existing models and extended the concepts to include the functions that form the hallmarks of the model solution. It aims at facilitating the understanding, the explanation and the anticipation of IT in governance. It uses three distinct and static variables, namely actors, levels and functions, to capture a snapshot of a governance system and provide a procedure which a State can adopt to improve their operations (e.g., increase efficiency and effectiveness), better regulate the transformation process and improve the decision-making process while increasingly involving the citizens.

Key words: eGovernance, model, system, IT, implementation, transformation

INTRODUCTION

Backus (2001) stated that eGovernance (Electronic governance) is more than just a government website on the Internet. But what is it exactly may be seen in the reasoning and decision making processes of governance (Zimmermann, 2005). EGovernance may be defined as the application of electronic means of interaction between government, citizens and business, as well as the internal government operations to provide an effective and efficient framework for collective problem solving. Framework in this context means a set of rules, regulations and governance structures that enable the functioning of the underlying governance system. The goal is to provide a one-stop, non-stop, efficient, effective, responsive, transparent governance through the use of information technology. An egovernance model therefore serve as a reference for governments to position where a project fits in the overall evolution of an egovernance strategy. This calls for choosing those models of egovernance which enhance the public value of information being supplied (Vikas, 2005).

The modeling approach presented here partly follows the framework proposed by Sol (1990), which consists of the way of thinking, the way of modeling and the way of working. The focus is on the way of modeling. In this regard, a clear distinction is drawn between conceptual models and descriptive models. Conceptual models define and mark the boundaries of the issues within the problem area to be focussed upon. Descriptive models allow the analysis, description and diagnosis of the issues, which are useful for leading to deeper understanding of the situation under investigation, to determine what must be done

and to offer possible solutions to the problem(s) (Checkland and Scholes, 1981). Based on the classic divide and conquer principle, the model facilitates the division of a situation into smaller parts, using the concepts of input/output process, each part partitioned from other systems using the concept of systems boundary and environment.

The actor-variable in a system reveals the character and the objectives of the actors involved in collective problem solving processes. Actors come from different backgrounds, such as State, non-State, public or private actors. The level-variable identifies the various organizational or political levels on which collective problem solving processes take place. Levels can be local, regional, national or international. The function-variable represents three core functions, namely policy-making, regulation and service delivery.

The three variables are used to capture a snapshot of the governance system at any point in time. However, governance systems are not stable but are in a continuous development and change process. As a matter of fact, the eGovernance model contains a fourth variable, the technology variable. The four conceptual cornerstones out of which the economics of governance works are governance, transaction costs, adaptation and interdisciplinary social science (Williamson, 2005). Those roles of IT in governance systems can be adapted and used to describe the past and to anticipate the future development path of a governance system.

The technology variable can be used to: mirror the existing reality of the system the governance system, Analyze the mechanisms, structures and dependencies in the physical reality of governance system, implement corrective and steering measures in governance mechanisms or newly created instrument of governance back into the physical reality of the governance system and regulate i.e., monitor and control the functioning of the governance system.

These variables represent the core of the eGovernance model. Whereas the variables actor, level and function stand for the static snapshot of the governance system, the technology variable stands for the dynamic components to the model.

MATERIALS AND METHODS

In a survey conduct between Nov. 2006 and March, 2007 in 30 communities selected from 10 out of the 17 Local Government Areas (LGA) of Enugu State and 22 government establishments on e-readiness for Enugu State, Nigeria. Okoronkwo and Inyiama (2008), attempted to answer to the question: what do we want a model of IT do in governance? From the results of the study, it became necessary to create and use a model to answer the question. Therefore, this model for the adoption IT in governance was developed to fulfil four functional specifications which address the question, as shown in Fig. 1. These functional specifications are:

The functional specifications that the model is used to perform include description of the Present Situation (PS), qualification of the PS, definition of the future desired situation (DS) and the transformation of IT from the PS to the improved DS. A conceptual model

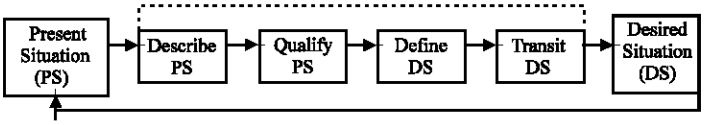

Fig. 1: Functional Specifications of the Model

based on the management paradigm, which defines the IT related issues to be focussed upon is used. A simple criterion of existence is used to attain this objective. This is followed by qualification of the PS based on the criteria of efficiency and effectiveness. Many issues related to development of information systems have in the past focussed mainly on efficiency and much less on issues related to effectiveness of information systems, use of the criterion of effectiveness seeks to redress this imbalance.

The process is such that once the PS attains the DS situation; the latter becomes the PS for a new improvement cycle and the cycle is repeated all over again, with the current values as input to the next phase. Every effort is made to prevent the situation from deteriorating through continuous monitoring and taking preventive actions.

The objective of description of the PS is to determine, by way of depiction, what IT resources and management processes exist in a given institution. This takes the form of performing a checklist of issues listed in the model to determine if they exist. The qualification assigns values or attributes to the issues that have been shown to exist and then analyzed. In this way it is possible to determine whether or not the PS requires improvement. Definition of the future DS states what that the state aspires to be which in comparison is better than the PS. Transformation is achieved by carrying out a series of specific actions aimed at bringing the PS to the DS.

The Modeling Process

The process of creating the preliminary model relies partly on the results of the study conducted in 2007 (Okoronkwo and Inyiama, 2008) and partly on the conceptual models developed at Delft University of Technology, Department of Information Systems and Software Engineering (ISSE). The results of the survey were analyzed using a software package; Special Package for Statistical Surveys (SPSS 12.0.1) (IBM, 1968) to collate the responses, while proportional (Z test), t-tests and Chi-Square tests were used to test a number of hypotheses for the study. The process in the research was augmented with proven models and the creation was undertaken in two phases:

- First a compilation of a framework of issues from established models and the study
- Then the selection of prioritized issues from the list based on relevance and resource

From the study, it is clear from the point of view of users interviewed, that the requirements summarized in Table 1 are critical and indicative of the direction in which the research was carried out. Using proven models, similar issues which have been researched are shown to be relevant to eGovernance systems. Such issues include preconditions that

Table 1: User requirements

Issues from proven model	Issues from the study
Availability, adaptability $ compatibility of IT	Accessibility, reliability, adaptability
Compatibility, confidentiality $ controllability of IT facilities	Training opportunity
Interoperability, maintainability, performance	Durability, integrity, control, safety/security, privacy/portability,
Reliability $ robustness, exclusivity,	confidentiality
Flexibility, integrity of IT and	
Continuity of IT functions	Efficiency, effectiveness
Safety of equipment/user	Internal communication
Security of hardware, software, data sets	User contribution
Transparency of use of IT	
User friendliness of IT	

must exist before any meaningful IT application can be contemplated. Also, we need to define and formulated the requirements within an environment that consists of a variety of situational factors since the application of IT is contingent upon these factors. There is the need to study the external environment to develop strategies that can help organizations to survive in this dynamic world. Thus by examining both strands we can gain a perception of what should constitute a model.

The model was created by taking the following two steps:

Step 1: Create a comprehensive list of issues in each entity using the management paradigm and the results from the Studies:

Expanded List of Issues

Comparing the list of issues obtained from the two sources, it was observed that the list needed to be expanded to cover additional issues which include:

Preconditions

These are statements in a policy framework of user requirements formulated by senior management and include:

- (IPP) Information Policy and Plan, Centralization and decentralization of; activities, hardware and software, Concentration and de-concentration of hardware and software, financial resources, hardware and software supply lines and sources, staffing, safety and security directives, standardization directives and service level agreements

Situational factors (contingency factors); are the aggregate of biological, psychological and socio-cultural factors acting on an individual or group to condition behavioural patterns. These factors influence the ways in which IT is implemented and managed. Consequently, recommendations, directives, principles and rules are not formulated without reference to the situational factors. Two types of situational factors are distinguished here:

- Specific factors: size, location, technology environment, culture, communication infrastructure
- Generic factors: stakeholders, electric supply and distribution, communication infrastructure and digitization, standardization, socio-cultural environment, economic environment, political environment, legal framework, labour unions

IT Components Include

Hardware, software, data sets, procedures and people. Each IT component has its static characteristics, which do not change significantly with time, while implemented IT has dynamic characteristics, which change considerably with time. IT may exist in one or more of the following states:

- Information Policy and Planning (IPP), Development (D), Acceptance and Installation (AI), Utilization (U), Exploitation (E), minor /major Maintenance of IT initiated from states U/E, (M1/M2), respectively

Complexity Factors

These are factors related with the level of difficulty encountered in utilizing, exploiting and maintaining IT. It include: Quantity, distribution, diversity, dynamics, utilization, ownership, cohesion and functionality

Management of IT

This is defined in terms of the forms of management and processes: Functional Management (FM), Application Management (AM) and Technical Management (TM) at: Strategic Level (SL), Tactical Level (TL) and Operational Level (OL).

Information Technology Infrastructure Library (ITIL) Processes

Are sequenced tasks performed under IT management forms. They include: manager's set, service support, service delivery, software support, networks, computer operations, environmental strategy, environmental management and office environment.

Relationships

Various parts of a State need to work together in harmony to create a supportive environment. Relationships between the parts are keys to understanding and identifying problems related to IT in the various arms.

Influences

States exist in changing environments, which exert varying pressure and intensity on them. The objective here is to investigate the existence and influence of the following: economic, managerial, technological, donor, contractual, organizational, stakeholder.

Step 2: Select from the comprehensive list and retain a prioritized list of issues based on relevance and limitations.

DISCUSSION

The Management paradigm Fig. 2 is an example of conceptual models. The paradigm by Looijen (2001) provides the top-level view or concepts of an organization on IT related issues.

The paradigm consists of three basic entities: the real system (RS), Information Technology (IT) and the Management, Control and Maintenance (MCM) of information systems. In addition, the relationships between entities and the external influences constitute vital components of the paradigm. In the following sub-sections, we present models of the entities, relationships and the external influences.

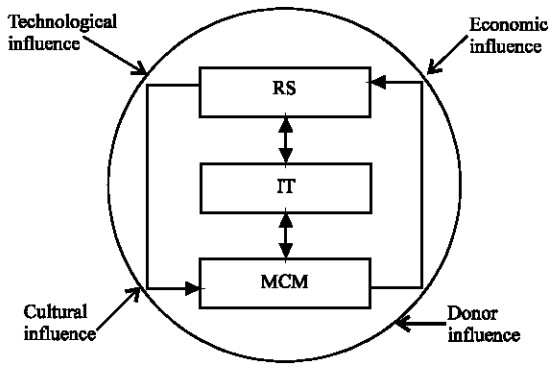

Fig. 2: The management paradigm

Modeling the Real System (RS)

The systems perspective on organizations and organizational processes is adapted in modeling the RS. According to this perspective, an organization can be viewed as a system of related objects (Checkland, 1981). In a State, there are people, often referred to as actors, equipment and materials used, called objects and activities that they perform, known as processes. In the RS entity, critical issues related to IT are the user requirements i.e., IT services and resources that the users demand from their organizations to support their day-to-day operational activities (processes).

Additional preconditions include policies on centralization or decentralization of IT resources, safety, standardization of hardware/software and Service Level Agreements (SLA). The situational factors include size, location, technology environment, culture and general communication infrastructure. The issues and factors are effectively modeled in the RS entity of the paradigm.

Modeling the Information Technology (IT)

In this entity IT, the components, the states in which they exist and the complexity factors within which they are developed, utilized, exploited and managed are modeled. First, we define our perception of IT as provided by Looijen (1998) that is, all the hardware with the relevant software, datasets, procedures and persons involved in the control/support of the real system or business processes. IT is better seen as social systems; a complex web of interpersonal relations which produces utilizes and communicates information (Land and Hirchheim, 1983). An Extended State Model (ESM) can also be modeled within the entity IT as shown in Fig. 3. The ESM consists of the states: IPP, Development (D), Acceptance and Implementation (AI), utilization (U1, U2), exploitation (E1, E2), Maintenance (M)

In The various states:

- IPP provides the policy framework for the entire organization
- The D represents the realization of IT in terms of acquisition of IT resources, training and setting up the infrastructure
- The AI for testing and acceptance of IT by the organization
- The U involves the users of IT in their day-to-day activities as they make use of the functions of the information systems
- The E takes place when the organization takes full advantage of IT to realize its goals
- The M for minor/major problems or modifications to be addressed concerning users and IT are addressed here
- The states AI, U1, E1 and M1/M2 can be repeated depending on the circumstances

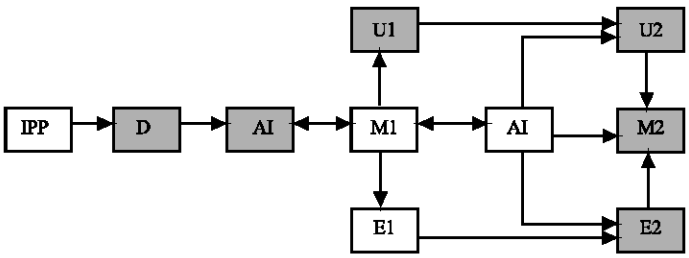

Fig. 3: The extended state model (states focused upon in shade)

Complexity Factors

IT exhibits complexities to both users and management in its utilization. The factors include the large numbers of IT resources (quantity), which can differ in type, make or origin (diversity) and may be centralized or de-centralized to a high/less degree (distribution) and can be subjected to changes (dynamics). Other complexity factors are the variety of functions that IT can have, which also must be mastered by users and technical staff (functionality) and are supplied by a number of linked components (coherence). Finally, in a large enterprise, some IT components may be possessed by different owners, (ownership) and users can make different demands and stipulate different preconditions (usage).

Modeling the Management, Control and Maintenance (MCM)

The MCM entity offers services most effectively and efficiently and positively influences the goals of the state. Three forms of MCM are: Functional Management (FM), Application Management (AM) and Technical Management (TM). Their common structure can also be modeled using Mintzberg (1979) logo (Fig. 4).

ITIL Processes

The Information Technology Infrastructure Library (ITIL) sets by the Central Computer and Telecommunication Agency of the United Kingdom (CCTA, 1990) and similar processes developed by different authorities can also be modeled within the entity MCM. In ITIL the following sets of IT management processes developed by CCTA include the manager's set, service support, service delivery, software support, networks, computer operations, environmental strategy, environmental management and office environment. As stated in its introduction the (CCTA, 1999), the primary objective of the ITIL is to establish the best practices and a standard of IT service quality that customers should demand and providers should seek to supply'. According to Looijen (1998), ITIL processes as well as processes recognized by other bodies bear a close relationship with the three forms of management, functional, application and technical. The relationship between the forms of management and ITIL processes is be visualized shown in Fig. 4.

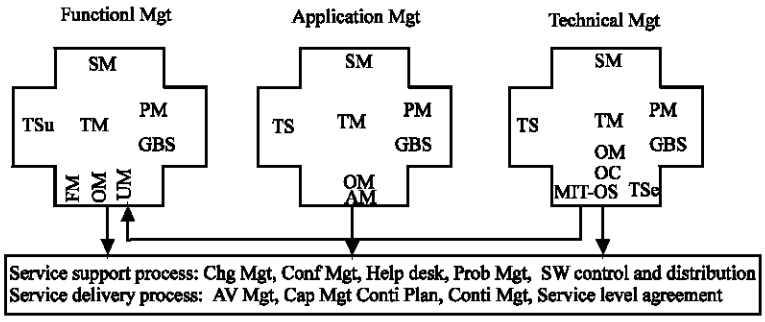

Fig. 4: Forms of Management and ITIL Processes. SM-Strategic Management, TM-Tactical Management, OM-Operational Management, PM- Personnel Management, GBS-General Business Support, TSu-Technical Support, UM- Utilization Management, FM- Functional Maintenance, AM-Application Maintenance, OC-Operational Control, MTI-OS: Maintenance of Technical, Infrastructure and Operational Support, TSe-Technical Services, ITIL and other processes

Modeling Relationships Between Entities

Lack of relationship between entities indicates independence of existence among the entities and this equally impacts on an organization in a negative way leading to poor management, while strong and positive relationships result in enhanced IT management. These relationships can be modeled in the paradigm by the arrows between and among the entities. Each of the basic entities can be viewed as consisting of sub-entities as shown in Fig. 5, which summarizes the relationships between the entities:

In RS→IT : Users in the entity RS impose requirements for resources in the entity IT to enable users to perform their activities, i.e., RS exploits IT

In IT→RS : IT resources support the activities in the entity RS through enhancing effectiveness and efficiency i.e., IT supports RS

In IT→MCM : Resources in IT also provide useful information required for IT management to the staff in the entity MCM i.e., IT supports MCM

In MCM→IT : Staffs in the entity MCM manage the resources in the entity IT, i.e., MCM uses or manages IT

In RS→MCM : The entity RS employs the entity MCM to manage its IT resources

In MCM→RS : Technical staff members in the entity MCM respond to requests in RS

The six relationships play significant role in effective and efficient management of information technology. Problems related to IT in organizations can commonly be traced to breakdowns in communication between the relevant entities as shown in Fig. 5.

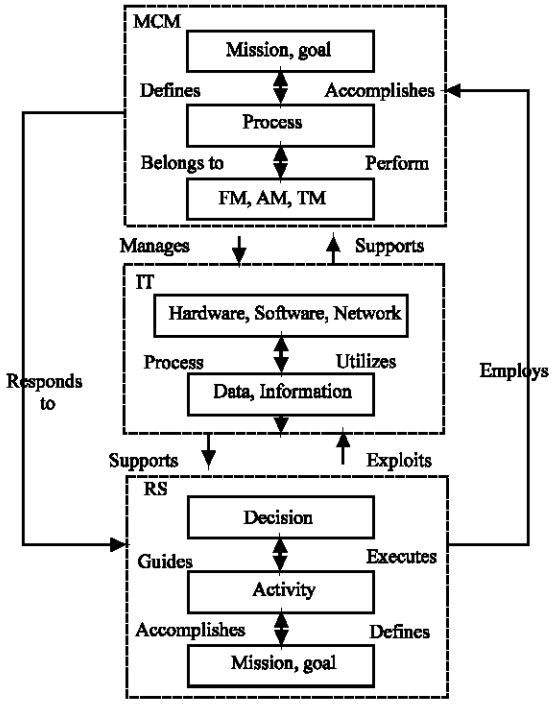

Fig. 5: Conceptual relationships between and within entities

The External Influences

There are always external influences (hereafter simply referred to as influences) that act on all organizations. A State receives materials, resources, users, employees, system of laws, finances and so on from its external environment and gives back to the same environment, feedback information in the form of reports, research findings and so on. Any significant perturbation in the external world is bound to impact on a State, either positively or negatively, depending on the nature and intensity or magnitude of the influence. This fact is especially true in much of the developing world in which utilization of IT is still a novel idea with far reaching effects upon those who have knowledge or access to IT resources.

The Model Outlook

An example of a conceptual descriptive model is illustrated in Fig. 6. Details of the focal concepts emerge at the descriptive level. Figure 6 shows the three entities of the Real System (RS), the Information Technology (IT) and the management system (MCM). Thus the management paradigm can be used fully to describe a real life case study. Their selection is based on the fact that they are considered critical in providing solutions to the IT problems.

In summary the conceptual framework comprises the three main entities of the management paradigm; the Real System (RS), the Information Technology (IT) and management, control and maintenance (MCM). In addition, the relationships between the entities and the influences that act on the entities together comprise the framework that now becomes the PS (current) with entities RS-1, IT-1 and MCM-1 in Fig. 7. This situation becomes the focus for qualification and transformation into the DS situation with corresponding entities RS-2, IT-2 and MCM-2. The conceptual model in Fig. 6 is the model.

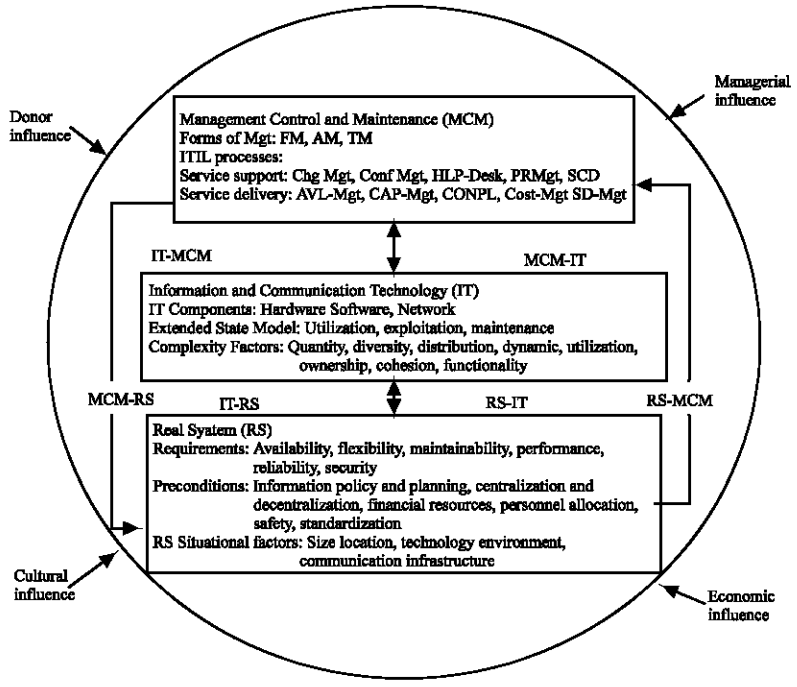

Fig. 6: The conceptual model (Mo)

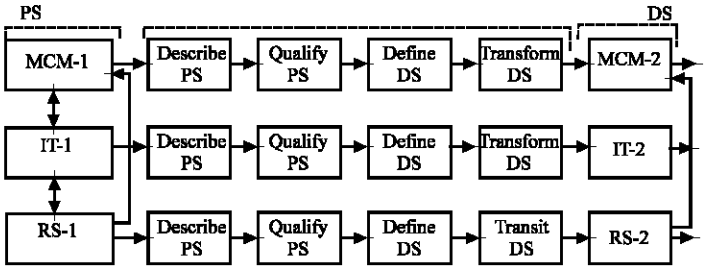

Fig. 7: IT application in governance using management paradigm in phases

CONCLUSIONS

A project as big as eGovernance system requires a good model to expound it so as to develop an effective, efficient and sustainable IT system. Research findings by the author show that higher premiums are placed more on technical issues than on managerial, even though both are at low IT levels in Nigeria. The consequence of this bias towards the technical and less to the managerial on the implementation and utilization of IT has been poor utilization and exploitation of IT. This has to change so that both issues are considered as complimentary and given equal attention.

The model developed here is used to answer the question How to develop a model of IT support that can describe and qualify PS, define DS and transform from PS to DS situations? Within the management paradigm used, issues in the entities RS, IT, MCM, relationships between entities and (external) influences, were identified and modeled.

After the definition of the required future situation, the next stage is to look ahead and visualize the situation in which the state that is dissatisfied with the present situation, defines where it wishes to be, given that it is capable of improving itself. The final stage in the improvement process occurs when specific and practical steps are taken, starting with the selection of the IT issue(s) and ending with the attainment of the goal or objective of the development/improvement process.

The application of the model bring to the fore a number of issues which are relevant to IT management in public organizations in any State, especially the enablers and inhibitors (or disablers). There is therefore the need for further research into this area for better understanding and integration of the technical and the social issues related to IT within the context of eGovernance in developing countries.

REFERENCES

Backus, M., 2001. E-governance and developing countries: Introduction and examples. International Institute for Communication and Development k. Research Report No. 3, April 2001 2. http://www.ftpiicd.org/files/research/reports/report3.pdf.

CCTA, 1990. The IT infrastructure library: An introduction. Proceedings of CCTA., pp: 7.

CCTA, 1999. Information Technology Infrastructure Library. Proceedings of CCTA.

Checkland, P.B., 1981. Systems Thinking Practice. John Wiley and Sons, Chichester.

Checkland, P. and J. Scholes, 1981. Soft Systems Methodology in Action. John Wiley and Sons, Chichester.

IBM, SPSS, 1968. Product demo results for: SPSS base. http://www.spss.com/downloads/Papers.cfm?ProductID=00035&Name=SPSS_Base&DLType=Demo.

Land, F.F. and R. Hirchheim, 1983. Participative systems design: Its rationale, tools and techniques. J. Applied Sys. Anal., 10: 91-107.

Looijen, M., 1998. Information Systems, Management, Control and Maintenance, Deventer. 4th Edn., Kluwer Bedrijfsinformatie, Holland.

Looijen, M., 2001. Information systems management and culture experiences from a Chinese perspective. Information Systems, Management, Control and Maintenance, pp: 37. http://alexandria.tue.nl/extra2/200410651.pdf.

Mintzberg, H., 1979. The Structuring of Organizations: A Synthesis of Research The Theory of Management Policy Series. Prentice Hall, UK, ISBN-10: 0138552703, pp: 512.

Okoronkwo, M.C. and H.C. Inyiama, 2008. E-governance: Tool to combat corruption in public offices. Proc. Nig. Comput. Soc., 19: 193-194.

Sol, H.G., 1990. Information systems development: A problem solving approach. Proceedings of the International Symposium on System Development Methodologies, (ISSDM'90), Atlanta, GA, pp: 13-14.

Vikas, N., 2005. Public value of information through electronic governance models. http://216.197.119.113/artman/publish/publicvalue.shmt.

Williamson, O.E., 2005. The Economics of Governance. University of California, Berkeley Press, California, pp: 57.

Zimmermann, W., 2005. E-strategy for E-government in cities: An introduction. UMP-Asia Occasional Paper No. 62