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Examining Flexibility of Processes and E-governance Performance

P. K. Suri[1]

Abstract

Governments across the globe are increasingly relying upon Information and Communication Technology (ICT) based solutions for improving their internal functioning and interfaces with stakeholders. The phenomenon is popularly termed as e-governance. Government system comprises multiple organizations with specific mandates and stakeholders to deal with. Efforts to infuse ICT in government functioning are generally directed at existing processes. Efficient e-governance, however, requires re-designing of organizational as well as cross-organizational level work processes. For maximizing value to users from e-governance efforts, governments need to assign high priority to process improvement. The paper aims at examining 'Flexibility of processes' and 'Performance of e-governance' by using statistically validated constructs. Flexibility of processes is measured in terms of 'options', 'change mechanisms' and 'adaptability to situations'. E-governance performance is viewed as value accruing in terms of 'efficiency', 'transparency', 'interactivity' and 'decision support' in the context of the study.

Keywords: *E-governance, E-government, E-governance performance, E-governance assessment, E-governance in agriculture, Process flexibility, Process re-engineering.*

Introduction

Information and Communication Technology (ICT) based solutions are increasingly being practiced by several governments all over the world for improving internal functioning and strengthening interfaces with stakeholders. The phenomenon is popularly termed as e-governance or e-government with its objectives varying as per country context (Torres *et al*., 2005). For example, Indian government views this as an ICT enabled path towards good governance and prefer to use the term e-governance (Planning Commission, 2007) for what is called e-government elsewhere (Harris, 2007).

In the pursuit of good governance through an ICT enabled route, governments of both developed and developing countries have to overcome several technological as well as non technological challenges as has been discussed by several scholars. It has been reported that many e-governance projects - in both developed and developing countries - have failed to achieve their objectives (Heeks, 2002; Verdegem and Verleye, 2009, Pitula and Radhkrishnan, 2011). Even though technology related challenges are gradually becoming less critical (ARC, 2008: p.81), resolving of non technological issues still remains a daunting task in many such initiatives. E-Governance projects generally involve several processes and actors spanning over multiple government organizations which, by their very nature, have assured budgets and independent

1. Professor, Delhi School of Management,
Delhi Technological University, New Delhi, India
E-mail: pks.suri@gmail.com

mandates. Process ownership is, therefore, a major challenge to be overcome for achieving integrated service delivery. The complex interplay of various actors and processes may cause emergence of turbulent situations which are often difficult to handle. Such complexities get further compounded in a federal government structure, if an e-governance initiative of a central government department demands collaborative implementation efforts by related departments of different state governments. For example, India follows a federal system of government where agriculture is a state subject. At the central level, the union government is responsible for formulating plans and policies for overall development of agriculture in the country through the state governments. The centre government is also responsible for ensuring adequate supply of quality inputs like seeds, fertilizers, pesticide, etc. with the help of state governments by enforcing specific central legal acts. The large span of stakeholders of this sector include farmers, domestic traders, exporting firms, fertilizer and pesticides manufacturing companies, employees, state agriculture departments, etc. Keeping into view the significance of agriculture in the Indian economy, e-Governance in agriculture has been included as a mission mode project under the National e-Governance Plan (NeGP) (www.mit.gov.in). Concerted efforts are being made, particularly by the central government, to improve service delivery at the grassroots through large scale e-governance projects (Suri, 2009: p.8). It is of utmost importance that empirically validated measures are devised for analyzing processes and performance in e-governance context in order to support the practitioners. Such measures are expected to provide the necessary base for taking appropriate corrective steps for making the government processes flexible enough so as to facilitate better performance of e-governance.

In this article, it has been attempted to analyze flexibility of processes and e-governance performance from the perspective of government officials involved in the planning of agriculture related e-governance projects. The article is based on the main study (Suri, 2009) which analyzed planning and implementation aspects of e-governance based on cross-case study of select agriculture related projects in India. The main study brought out a strategic framework for improving the performance of e-governance projects using Situation-Actor-Process-Learning-Action-Performance (SAP-LAP) framework (Sushil, 2001).

The objectives of this article having a limited scope, are as follows:

- To propose validated constructs for measuring flexibility of key processes and performance of e-governance in the study context.
- To analyze flexibility of processes and performance of e-governance in the study context.

The article is organized into eight sections. The paper starts with the introductory comments. Section 2 brings out a review of relevant literature. Section 3 discusses the methodology. Section 4 discusses macro and micro level research variables conceptualized for the study. Section 5 summarizes the opinion survey conducted for the study. The results of the analysis are discussed in Section 6. Section 7 presents research contribution, implications and limitations of the study. Finally, this study concludes with Section 8.

Literature Review

A review of literature conducted in the relevant areas, viz. flexibility of processes and e-governance assessment, is summarized as follows:

Flexibility of Processes

Government system comprises of several independent organizations with specific mandates and stakeholders to deal with. Public administration in most developing countries is highly bureaucratized and centralized (Saxena, 1996; Heeks, 2002). Efforts to infuse ICT in government

functioning are generally directed at existing processes. Efficient e-governance, however, requires redesigning of work processes, organizational level changes and integration of databases within and across organizations in order to take advantage from the technological convergence offered by ICT (Planning Commission, 2001; DARPG, 2003; Welch and Hinnant, 2003; Gupta *et al*., 2004: pp.137-138; Themistocleous *et al*., 2005; Koh *et al*., 2006; Silva and Hirschheim, 2007; ARC, 2008: pp.71-79; www.knowledgecommission.gov.in). For maximizing value to users from e-governance efforts, governments need to become citizens focused by according priority to modernizing of traditional structures, processes, and culture (OECD, 2003).

Flexibility in an organization helps to enhance competitiveness and performance (Sharma *et al*., 2010). According to Kawalek and Wastell (2005), the complexity and institutional inertia associated with public sector organizations need to be methodically handled through incremental process changes over time even though information technology can facilitate business process re-design (Davenport and Short, 1990; Hammer, 1990). Process change in organizations need to be considered as a continuous strategic initiative rather than initiating big radical redesigning programmes (Sundberg and Sandberg, 2006).

One of the latest paradigms in the governance practice is flexibility. Flexible governance is in better position to change and add capacities in a shorter time in keeping up with rapidly changing needs of the citizens. Flexibility is an effective means by which organizations can hedge against uncertainty in a fast changing environment (Shi and Daniels, 2003). Leeuw and Volberda (1996) define flexibility as the "degree to which an organization possess a variety of actual and potential procedures, and the rapidity with which it can implement these procedures, in order to increase the control capability of the management and improve the controllability of the organization over the environment". According to Palanisamy and Sushil (2001) flexibility enables to alter the information systems strategies, whenever organizational strategies are changing; reduces the built in resistance for change; and eases the organizational change process. It results from ability to incorporate changes in policies and procedures quickly and proactively in response to or in anticipation of changes in external environment. From e-governance perspective, flexibility may be viewed as ability of a government organization to respond to the changing requirements of citizens by fine-tuning the key processes. Process flexibility is a key requirement as the processes serve as the link between an organization and its partners (Stohr and Muehlen, 2008). Processes can be made more flexible by introducing the levers of options, change mechanisms and adaptability (Sushil, 2000a, 2000b: pp.51-68).

In the corporate sector, there are ample examples which demonstrate that smart business entities have been able to use IT effectively by re-designing core business process before applying IT (Feld and Stoddard, 2004; McAfee, 2006; Shpllberg *et al*., 2007; Upton and Staats, 2008). Adoption of similar practices by the project authorities is clearly visible in the popular Indian e-governance projects. IT induced changes in roles and responsibilities have been the feature of most of these projects. In a few e-governance projects in India such as BHOOMI, CARD, e-Procurement exchange, e-Seva and KAVERI, which were studied while conducting the main study, it has been found that government authorities have taken special efforts for process re-engineering before applying ICT to ensure accruing of better value from the systems.

E-governance Assessment

It is observed that the area of e-governance impact assessment is increasingly generating interest among scholars from both developed and developing countries. Grant and Chau (2005) have proposed a flexible and modular framework to represent e-governance vision and implementation that would be applicable across different governments. The framework is based

on common elements (strategic focus areas mapped to key functional areas) that are abstracted from several systems. Though conceptual frameworks such as this or the staged models (Layne and Lee, 2001; UN, 2008) are useful in conducting macro level assessment or analysis of e-governance services, it is required to have additional models and tools to analyze actual systems. Arguing that benefits from e-governance cannot be assessed using traditional measure, Gupta and Jana (2003) have proposed a multi methodology approach, synthesizing hard measures, soft measures and hierarchy of measures for assessing return on e-governance. The authors have cautioned that for the proposed framework to be applicable, a project should have reached the mature stage of e-governance. Such projects are, however, rare in India. The traditional financial appraisal measures such as 'Return on Investment', 'Internal Rate of Return', 'Net Present Value' and 'Payback' are relatively easy to define in a manufacturing environment but can be misleading when applied in the context of e-governance projects. These measures do not support the accomplishment of socio-economic and socio-political goals that generally characterize e-governance projects (Grimsley and Meehan, 2007; Lawson-Body *et al*., 2008; Irani *et al*., 2005). The framework brought out by Irani *et al*. (2010) for evaluating e-governance projects includes investment decisions, evaluation methods, culture, structure and post hoc evaluation with thrust on project outcomes. The authors have felt the need for assessing e-governance projects from multi-stakeholder perspectives. Esteves and Joseph (2008) have proposed a three-dimensional framework ('Maturity Levels', 'Stakeholders' and 'Assessment Levels') for the assessment of e-governance initiatives. The framework, however, is yet to be tested on real life e-governance project settings, as acknowledged by the authors.

A few researchers, in the recent past, have attempted application of Technology Adoption Models (TAMs) for analyzing e-governance systems as discussed by Sahu (2006). The TAMs have genesis in IT acceptance research. Most of the past empirical studies based on acceptance models have analyzed information systems developed for employees. In general, the acceptance models have not been widely adopted in Internet research particularly from the perspectives of consumers (Gilbert and Balestrini, 2004).

It is observed that there is hardly any empirical study in e-governance context which addresses the issue of analyzing performance from the perspective of governance reforms. A few studies conducted in the recent past are mostly based on single case studies involving a narrow group of educated citizens who use Internet for well structured applications such as paying income tax. For example, Wang and Liao (2008) have attempted to apply the updated model of information system success proposed by DeLone and McLean (2003) for assessing e-governance success. Lawson-Body *et al*.(2008) have used balanced score card approach to study the effect of website-supported 'Learning and Innovative', 'Internal Process', 'Value Proposition' and 'Financial' perspectives on 'E-Government Service Delivery Performance'. Both the studies are based on a survey of a specific group of citizens. The authors have emphasized on the need for conducting studies targeting multiple types of stakeholders to understand e-governance performance. Few studies (Chircu & Lee, 2005; Gil-Garcia and Pardo, 2005; Ghapanchi *et al*., 2008) have focused at exploring success strategies but not measures of success.

A few recent scholarly studies conducted in Indian context have emphasized on: measuring IT effectiveness in terms of improved effectiveness, improved decision-making, improved organizational responsiveness, and information systems on the whole (Gupta, *et al*., 2007); taking into account governance aspects in the performance measures (Mitra and Gupta, 2008); pre-defining effectiveness parameters of e-governance programmes and cautiously managing factors of change for giving real benefits to stakeholders (Kumar, 2009); managing continuity and change forces and linking it to strategic outcomes for better value creation through e-governance (Nasim and Sushil, 2010).

Published evaluation reports (DIT, 2003, pp.32-57; Bhatnagar, 2004, pp.95-136; DIT, 2004, pp.30-64; DIT, 2005a, pp.37-75) of a few e-governance projects in India (AKSHYA, BHOOMI, CARD, e-Procurement, Exchange, e-Seva, FRIENDS, GYANDOOT, KAVERI, Lokvani, Nagarpalika) which were studied for the purpose of this research, reflect governance reforms related benefits from these projects. Performance of these projects has been adjudged better in terms of ensuring easier access to service, offering of comprehensive and reliable service, time and cost savings, improved transparency in government functioning, improved interactions with government, faster processing of requests, improved monitoring and control, improved decision making, etc. These studies have been found useful by the Administrative Reforms Commission (ARC, 2008) also. However, it has not been attempted to analyze key processes and e-governance performance from the perspectives of service providers.

Methodology

The methodology adopted for the study broadly involves literature review, identification of projects for the study, conceptualization of research variables, and conduction of an opinion survey for

Table 1: National level Agriculture Related Important Projects in India

Project and Organization	Coverage	Focus/Purpose	Key Intended System Beneficiaries	Implementation Status
AGMARKNET www.agmarknet.nic.in, Directorate of Marketing and Inspection (DMI)	All India	Establishment of an ICT based system for collecting and disseminating daily market information pertaining to several agricultural produce wholesale markets located throughout the country	Farming community, officials of markets, centre and state government officials	Operational since 2002
Kisan Call Centre http://agricoop.nic.in/ PolicyIncentives/kisanCallfirst.htm, Directorate of Extension (DoE)	All India	Providing agricultural extension support	Farmers, government officials	Operational since 2004
DACNET www.dacnet.nic.in IT Division, Department of Agriculture and Co-operation (DAC)	All India	Intranet for messaging, collaboration and implementing e-governance applications	Officials of DAC	Operational since 2005
GrapeNet www.apeda.com Agricultural and Processed Food Products Export Development Authority (APEDA)	Maharashtra, Karnataka, Andhra Pradesh	Web based system integrating various stakeholders in the export of grapes	state/district level horticulture officials, labs, exporters, government officials at central level	Operational since 2004
Computerized Registration of Pesticides (CROP) www.cibrc.nic.in, G to B, Central Insecticides Board and Registration Committee (CIB and RC)	All India	Streamlining of procedures involved in registration of pesticides as per Insecticides Act, 1968	Pesticides industry and government officials	Operational since 2002
Integrated Fertilizers Management Information System (IFMIS) www.fert.nic.in,	All India	Ensuring adequate supply of good quality fertilizers to farmers at affordable price	Fertilizer companies, government officials of centre and states	Progressively being evolved and enriched as part of successive plans since 1995. Web based interface for companies

Source: (APEDA, 2005; DAC, 2005, pp. 127-128; NIC, 2005; DAC, 2006, pp.73-75; DAC, 2007, pp.69-71; DIT, 2005b, p.82; DIT, 2006, pp.89-90; DIT, 2007, pp. 67-70; DoF, 2003; DoF, 2007; TCIL, 2007; DMI, 2008, project web sites)

empirical analysis. A review of literature was conducted on areas relevant to the study. Based on the review, six agriculture related e-governance projects of national importance in India have been identified for the study. Only such large projects were considered where it could be reasonably assumed that services have started reaching the intended beneficiaries. The basic criteria for selecting a project were, therefore, taken as that the project should have been operational for at least one year at the start of the main study in 2005 and that the project is of national importance with country-wide or multi-state implications. With these criteria, seven projects were short listed as summarized in Table 1. Out of CROP and PQIS projects, the study of CROP system was preferred over PQIS keeping in view its uniqueness in the form of amendment of a legal act for streamlining pesticides registration before applying IT.

An understanding about key processes and expectations from the identified projects is developed which has led to conceptualization of constructs to measure flexibility of processes and e-governance project performance in the study context. To keep the research design simple and implementable, only such performance aspects and processes were considered which are commonly applicable across the six projects. These process and performance aspects were mapped with literature.

A questionnaire was developed to capture flexibility and performance related feedback. Key senior level officials involved in the planning and strategy formulation of each of the six e-governance projects were identified with the help of respective project nodal officers. It was observed that generally in each project, there are five to eight senior level officials who are involved in the planning and strategy formulation. These officials could be surveyed with census approach as their number was found to be small in each project. The observed mean values of the data collected have been used for analyzing flexibility of processes and performance in the study context.

Conceptualization of Research Variables

A review of literature reveals lack of empirical studies which attempt to bring out validated measures to analyze flexibility of processes and performance from the perspective of government officials in e-governance context. This study attempts to address this gap. Appropriate constructs have, therefore, been conceptualized in terms of macro and constituting micro variables to measure these aspects. These variables, which are defined as follows, have been identified based on a review of literature (Suri, 2009), insights gained through a pilot study of the ongoing Agricultural Marketing Information System Network (AGMARKNET) e-governance Project (Suri, 2005) and past experience of executing ICT based projects in government departments. It is clarified here that only such processes and performance aspects have been considered which are commonly applicable across the six identified projects.

Macro Variables

The macro research variables for the study, viz. 'Flexibility of processes' and 'Performance of e-governance' are defined as follows:

Flexibility of Processes

This variable is conceived in terms of available options, change mechanisms and adaptability of processes to changing situations (Sushil, 2000a, 2000b: pp 51-68). The processes conceived in the context of the study are: preparation of project plan/Expenditure Finance Committee (EFC)/Standing Finance Committee (SFC) memorandum, capacity building, content development, content delivery and management of change.

Performance

This performance macro variable is conceived as fulfillment of the project objectives in terms of realization of expected benefits of e-governance. The common benefits which are applicable across the e-governance projects under study are identified as achieving efficiency in government operations, bringing transparency, facilitating interactivity among internal and external actors and aiding the decision support process.

Micro Variables

Flexibility of Processes

The micro variables constituting the macro variable 'Flexibility of processes' are defined as:

Options: This micro variable deals with options available in the key e-governance processes conceived for the project. A process with lesser number of controls is considered to be more flexible. For example, the process of capacity building can be viewed as more flexible if there is provision for continuous learning/skill up-gradation of actors. A onetime capacity building programme introduces rigidity in the capacity building process. Similarly, confining the content development process to departmental boundaries introduces rigidity in the process.

Change mechanisms: This variable captures existence of change mechanisms that can act as levers which can gradually transform a rigid process and make it more flexible. For example, if employees are rewarded for upgrading their skills, they will get motivated to take own initiatives in that direction and capacity building will not remain limited to pre-defined training programmes.

Adaptability to situation: The variable captures a process's adaptability aspect. A process is considered as flexible if it can adapt to changing situations. For example, if employees are able to make effective use of the ICT tools made available to them, the capacity building process can be viewed as adaptable to the new environment.

Performance of E-governance

The micro variables constituting the macro variable 'Performance of e-governance' are defines as:

Efficiency: This micro variable deals with efficiency achieved through e-governance in terms of fast execution of the core process (UNESCO; Esteves and Joseph, 2008; Mofleh *et al*., 2009), simplification of government procedures (UNESCO; UN, 2008; Mofleh *et al*. , 2009), reduced paper work (Evans and Yen, 2006; Planning Commission, 2007; UN, 2008) and decreased communication cost (Evans and Yen, 2006; Planning Commission, 2007; UN, 2008) while transacting with government.

Transparency: This micro variable addresses delivery of government service in a transparent manner, i.e. whether the service is reliable (OECD, 2003; De, 2006), comprehensive (Bhanagar,2004; De, 2006)), easily accessible (World Bank; Harris, 2007; Esteves and Joseph, 2008) and delivered in a fair manner (UNESCO; Harris, 2007; Planning Commission, 2007).

Interactivity: This micro variable deals with improved interactions facilitated by the e-governance service (World Bank; UNESCO; Bhatnagar, 2004; Jaeger, 2005; Tan *et al*., 2005; Evans and Yen, 2006; Esteves and Joseph, 2008; UN, 2008; Mofleh *et al*., 2009). The interactions can be with internal actors, with actors belonging to other related organizations, with beneficiaries and with government as per the respondent category.

Decision support: This micro variable reflects better decision support in terms of improved planning and decision-making (UNESCO; Evans and Yen, 2006), and better monitoring and control (Bhatnagar, 2004) made possible by an e-governance service.

Survey of Planners

Questionnaires Development

All the six projects identified for the study were studied to develop basic knowledge about the project objectives and expected benefits. Flexibility of processes and performance related questions are developed keeping in view the observed commonalities in terms of respective micro variables across the six projects. Questions were standardized to ensure their applicability across the projects. For better understanding and interpretation, the standard performance related questions were qualified with project specific contexts. The questionnaires were subjected to face, criteria related and content validity tests (Kerlinger, 1983, p.458) for fine-tuning before launching the survey. The validation of questionnaires was followed by pre-testing of questionnaires. Ambiguity in questions was removed and wording of questions improved based on learning from the field visits. A five point Likert scale was used with options as nil (N), to a small extent (S), to a medium extent (M), to a large extent (L) and to a very large extent (VL). The scale was transformed into five continuous classes as 0-0.2 (N), 0.2-0.4 (S), 0.4-0.6 (M), 0.6-0.8 (L) and 0.8-1.0 (VL) and applied on the observed data for the purpose of statistical analysis. The questionnaires along with mean observed values are presented in Appendix I in a compact form. Most of the prospective respondents were approached in person. This was feasible as the planners in each project were generally centrally located and their number in each project was also small. In all, 36 valid filled-in questionnaires were received with number of respondents ranging from five to eight in case of each of the six projects.

Reliability and Validity Analysis

The Cronbach's Alpha values, measuring internal consistency (Kerlinger, 1983, pp.451-452) of the performance constructs, are found to be 0.85 and 0.94 respectively. These values are well above the threshold level of 0.6 that is recommended as acceptable for empirical research of this nature (Hair *et al*., 2006, p.118). The macro and micro variables are subjected to factor analysis for validating the constructs (Kerlinger, 1983, pp.659-678; Hair *et al*., 2006, pp.90-114). The construct acceptability criteria are based on the values of cumulative extracted squared loading. Hair *et al*. (2006) have recommended that factor loadings greater than 50 per cent may be considered practically significant. At the macro level the factor loadings in respect of macro variables 'Flexibility of processes' and 'Performance of E-governance' are found to be 65.3 and 80.9 per cent respectively which are well above the threshold value. At the micro level, the factor loadings in respect of the constituting variables of 'Flexibility of processes', viz. 'options', 'change mechanisms' and 'adaptability to situation', are found to be 57.1, 50.3 and 48.2 per cent respectively which are above or near the threshold value. The factor loadings in respect of the constituting variables of 'Performance of e-governance', viz. 'Efficiency', 'Transparency', 'Interactivity' and 'Decision support', are found to be 73.0, 65.2, 82.3 and 68.7 per cent respectively which are above the threshold value. It has been further tested that all the items constituting the macro/micro variables are loading on the respective macro/micro variables.

Based on the factor analysis and reliability analysis conducted above, the constructs are treated as validated and used for further analysis.

Univariate Analysis and Discussion

The survey data is used to conduct univariate analysis with respect to the macro variables 'Flexibility of processes' and 'Performance of e-governance' and the corresponding micro variables. The statistics computed include mean, coefficient of variation, range, and quartile percentiles as shown in Table 2. The observed values of statistics pertaining to macro and micro variables are discussed below.

Table 2: Univariate Statistical Analysis for Micro Variables (Base Survey: Planners)

Planners											
Variable	N Valid	Mean	SE(Mean)	SD	CV (%)	Range	Min	Max	Percentiles		
									25	50	75
Flexibility of Processes (FP)	**36**	**0.46**	**0.03**	**0.15**	**32.61**	**0.77**	**0.08**	**0.85**	**0.36**	**0.43**	**0.55**
Options (OPT)	36	0.49	0.04	0.23	47.01	0.90	0.10	1.00	0.30	0.43	0.69
Change mechanisms (CM)	36	0.42	0.03	0.18	42.06	0.80	0.05	0.85	0.30	0.35	0.55
Adaptability to situation (ADP)	36	0.47	0.03	0.17	35.94	0.75	0.10	0.85	0.35	0.50	0.59
Performance of E-Governance (PERF)	**36**	**0.70**	**0.03**	**0.17**	**24.28**	**0.69**	**0.31**	**1.00**	**0.59**	**0.70**	**0.82**
Efficiency (EFFI)	36	0.73	0.03	0.19	26.16	0.69	0.31	1.00	0.63	0.75	0.86
Transparency (TRANSP)	36	0.73	0.03	0.16	22.41	0.69	0.31	1.00	0.69	0.75	0.81
Interactivity (INTER)	36	0.61	0.04	0.22	35.41	0.92	0.08	1.00	0.50	0.63	0.75
Decision support (DECSP)	36	0.63	0.04	0.22	34.08	0.75	0.25	1.00	0.50	0.63	0.75

Flexibility of Processes

Flexibility of processes is observed to be of medium extent as per the survey data. The lesser value of flexibility measure at macro level is reflective of rigidity of conceived processes encompassing e-governance projects in the study context. The means of the three micro variables constituting flexibility of processes are fairly consistent and fall in the medium extent range. Among the questions pertaining to the first micro variable, viz. 'options (OPT)', the planners feel that it is to a small extent that project plans are changeable during the plan period though the plans have adequate provision (large extent) for continuous learning of the employees. Developing contents based on feedback of stakeholders, delivering contents by integrating backend databases across departments and restructuring organizational framework or re-engineering existing processes are being practiced to a medium extent, with actual values nearing the upper limit of small extent range. In general, the observed values reflect that the conceived processes have limited options. Analyzing means of responses to second micro variable, viz. 'Change mechanisms (CM)', it is observed that it is not easy to make changes in an approved project; it is to a small extent that employees are encouraged to improve their IT skills; it is to a medium extent that the present set-up is equipped to build customized contents as per regular feedback; the present set-up supports integration of backend databases to a medium extent (actual observed value is lower class limit of medium range); and the suitability of the present set-up to support e-governance is observed to be of medium extent. The responses to four of the five questions belonging to the third micro variable, viz. 'Adaptability to situation (ADP)' fall in the medium extent range. The response to the remaining question about the present system's ability to provide a unified service to citizens is rated as of small extent. As per respondents, it is to a medium extent that the present planning framework can cater to the emerging requirements not conceived at the project conceptualization stage. Responses to the questions about 'making best use of IT infrastructure by employees', 'ability of project service to meet specific needs of the citizens' and 'capability of the government system in making the e-governance benefits reach the citizens' are also observed to be of medium extent. In general, the observed values of the three micro variables, viz. 'OPT', 'CM' and 'ADP' which constitute the macro variable 'Flexibility of processes (FP)', are reflective of the rigid character of processes encompassing e-governance projects.

Performance of E-Governance

As per the observed values, overall performance of e-governance, as perceived by the planners, is in the large extent range even though the processes being dealt with at their level are found be exhibiting a rigid character. It may be noted that it is the planners who are responsible for conceptualizing the e-governance projects and arranging for the required resources for project execution. It is, therefore, possible that the planners might have opined in favor of higher project performance in order to justify the investments made or they may be actually drawing more benefits from the e-governance initiatives when compared with officials operating at lower levels and the intended beneficiaries. Further, the planners generally operate from headquarters level and are thus relatively better equipped for using the ICT infrastructure developed under the projects as compared to operational level officials in the field and beneficiaries. At the micro level, their perception levels about performance in terms of 'Efficiency', 'Transparency', 'Interactivity' and 'Decision support' are found to be in the large extent range with the observed values of 'Interactivity' and 'Decision support' marginally qualifying for the large extent range. In other words, planners perceive that e-governance has contributed more to improve efficiency and transparency when compared with interactivity and decision support (as defined in Section 4 in the study context).

Research Contribution, Implications and Limitations

Research Contribution and Implications

The need for re-designing of existing structures and processes at different layers of the government to achieve effective e-governance has been highlighted in many previous studies (www.knowledgecommission.gov.in, OECD, 2003; Silva and Hirschheim, 2007, ARC, 2008, pp.71–79). Further, there is a general lack of measures to monitor performance of e-governance projects (Hung *et al.*, 2006; Yildiz, 2007). This study, based on cross-case analysis of six agriculture related projects in India, may be viewed as a stepping stone for arriving at validated constructs to measure flexibility of processes and performance of e-governance. An opinion survey of select government officials belonging to the six ongoing projects, was conducted to populate the constructs and perform univariate analyse. The analysis reflects that planners are expected to keep in view the likely outcome from an e-governance project while formulating a project plan. For example, the performance variables need to be clearly identified in terms of likely improvement in efficiency, transparency, interactivity and decision support. These aspects may be prioritized as per their relevance in the project situation and metrics for measuring them need to be defined for periodically reviewing the outcomes. Similarly, the construct for measuring 'Flexibility of processes' is expected to sensitize the planners for appropriate actions in order to transform the processes involved as versatile and adaptable. They can initiate actions to modify the conventional processes such that they are not only simple to execute but also flexible enough to change with changing times (Sharma *et al.*, 2010).

From the viewpoint of researchers, the validated constructs can be further used to explore the relationship between the two by taking 'Flexibility of processes' as independent variable and 'Performance of e-governance' as dependent variable. Based on the conceived variables, following macro and micro level hypotheses of association are formulated. These may be statistically tested for examining the relationship between the conceptualized flexibility macro/micro variables with the performance macro/micro variables in the context of the study.

The macro level alternate hypothesis, conceptualized on the basis of this study, is:

HAP1: Flexibility of processes is a predictor of performance of e- governance.

The corresponding null hypothesis for HAP1 is:

HAP0: Flexibility of processes is not a predictor of performance of e-governance.

The general micro level alternate hypotheses of association are of the form:

HAPij: i^{th} micro variable is a predictor of j^{th} performance micro variable; i ª {OPT, CM, ADP}; j ª {E, T, I, D}.

The predictive relationships which get revealed from such an analysis may be interpreted in the context of each of the case studies using Interpretive Matrix Tools (Sushil, 2005) to arrive at the interpretation of influencing links between 'Flexibility of processes' and 'Performance of e-governance'.

Limitations

The study is constrained by lack of similar past studies. As such, there is ample scope for improving the proposed constructs by studying more e-governance projects pertaining to different areas.

Conclusion

In the recent past, many e-governance initiatives have been taken across the world. Studies have, however, revealed high risk of failure associated with e-governance projects. In this article, two constructs have been proposed to measure flexibility of the key e-governance processes and performance in the study context. The constructs have been statistically validated. An opinion survey of government officials involved in planning of six agriculture related e-governance projects, has been conducted to populate the constructs for further analysis. It has been found that there is much scope for improving the flexibility in the underlying processes as well as performance of e-governance in the context of the study. The analysis has brought out implications for both researchers and practitioners. It has also provided ground for proposing hypotheses of association for testing predictive relationship between 'Flexibility of processes' and 'Performance of e-governance'.

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Appendix I

Questionnaires and Observed Mean Values

(a): Flexibility of Processes

	Process	Option	1	2	3	4	5	Option
F1.	**Preparation of project plan/EFC/SFC memo**	One time process in a plan period						Dynamic process (Changeable)
F2.	**Capacity building**	One time activity						Provision for continuous learning
F3.	**Content Development**	Department's own perception						Based on regular feedback of stakeholders mentioned in SF1
F4.	**Content Delivery**	Confined to project specific database (without collaborating with other related projects)						Based on inter-organizational collaboration at centre/state level (integrated databases within and across related organizations)
F5.	**Management of Change**	Application of IT without undertaking any restructuring/process re-engineering						Restructuring of existing organizational framework/re-engineering of processes to support e-governance

	Aspect	N	S	M	L	VL
Preparation of project plan/EFC/SFC memo						
F1.1	Extent to which it is easy to change an approved plan (EFC/SFC memo) in the present planning framework					
F1.2	To what extent the present planning framework is able to cater to emerging requirements which were not conceived while planning(at the time of preparation of project p lan/EFC/SFC memo)					
Capacity building						
F2.1	To what extent employees are given incentives/encouraged for upgrading their IT skills					
F2.2	To what extent employees are in position to make best use of ICT infrastructure					
Content Development						
F3.1	To what extent the present set up is equipped to develop customizing contents based on regular feedback from customers (citizens)					
F3.2	To what extent the present web-site/service is able to deliver information as per specific demands/needs ofdifferent users					
Content Delivery						
F4.1	To what extent the established government system facilitate integration of databases across related departments at centre/state government level					
F4.2	To what extent the present Government system is able to provide domain specific unified service to citizens independent of departments at centre/state government level					
Management of Change						
F5.1	To what extent the existing Government system at centre/state government level is suitable to support e-governance					
F5.2	To what extent the present Government system ensures reaching of e-governance benefits to the grassroots					

Observed Mean Values

Process	Extent of			
	Options	Change Mechanisms	Adaptability to Situation	Flexibility
Preparation of project plan/EFC/SFC memo	0.285	0.292	0.410	0.329
Content Development	0.778	0.375	0.542	0.565
Content Delivery	0.493	0.549	0.563	0.535
Management of Change	0.465	0.396	0.368	0.410
Content Development	0.431	0.472	0.465	0.456
Mean	0.490	0.417	0.470	0.459

(b) Performance of E-governance

	Extent to which the service (project name):	P (n=36)
1.	Helps in getting faster access to *(-)*	0.813
2.	Has simplified the procedure to access *(-)*	0.708
3.	Has helped me by reducing dependence on printed material/correspondence *(-)*	0.688
4.	Has helped in reducing communication cost *(-)*	0.715
5.	Provides *(-)* information which is reliable	0.722
6.	Meets *(-)* information requirements	0.715
7.	Helps in getting easy access to *(-)*	0.785
8.	Has helped in ensuring fairness *(-)*	0.715
9.		
9.1	internal actors (Hqrs and field offices/operational level staff)	0.679
9.2	external actors belonging to other related organizations	0.549
9.3	Beneficiaries	0.611
10.	Helps in *(-)* planning and decision making	0.653
11.	Helps in monitoring and control *(-)*	0.611

(-): project specific qualifiers are presented in Appendix I (c). In the respective questionnaires, care has been taken by forming the sentences properly.

(c): Project Specific Qualifiers for Performance

S.No.	AGMARKNET	KCC
1.	country-wide market information	agricultural related information
2.	market information	to get answers to agriculture related queries
3.	for seeking agricultural marketing related information from government agencies	for seeking agriculture related information from government agencies
4.	for accessing market information	for accessing agriculture related information
5.	commodity arrivals and prices	agriculture
6.	agriculture marketing related	agriculture related requirements of information seekers
7.	market-wise information	agriculture related information
8.	by providing unbiased/un-manipulated market information	by removing bottlenecks in seeking of agriculture related advice from government
9.	agricultural marketing related matters	agriculture related matters
10.	agricultural marketing related	agricultural related planning and decision making at the level of citizens/government
11.	over market situation (arrivals and prices)	different developmental schemes in agriculture
	DACNET	GRAPENET
1.	information exchange with Hqrs/ other DAC offices/divisions	country-wide grading activities
2.	execution of routine tasks	for issue of CAG/ Phytosanitary Certificate
3.	Has helped in reducing paper work	for issue of CAG/ Phytosanitary Certificate
4.	seeking information	for implementing grapes certification programme
5.	on agriculture	grapes consignments inspected by approved labs/issue of CAG
6.	agriculture related	requirements for issue of CAG/ issue of Phytosanitary Certificate
7.	agriculture related information pertaining to other divisions	approved labs reports / CAG
8.	office circulars /notifications /opportunities/ new initiatives	by providing transparency and cutting down delay
9.	agriculture related matters	grapes certification related matter
10.	related to work assigned to you	QC related
11.	agriculture schemes and taking corrective measures	over issue of CAG/ Phytosanitary certificate
	CROP	IFMIS
1.	registration application	preparation of monthly movement plan/ faster processing of financial claims related to subsidy, freights, etc.
2.	has helped in simplifying procedures	industry-government co-ordination
3.	has helped in reducing paper work	reducing paper work
4.	pesticides related information	reducing communication cost
5.	pesticides related	fertilizers related matters
6.	pesticides related	fertilizers related information requirements
7.	application status/pesticides norms information	monthly movement plan
8.	in handling of applications by the government	in co-ordination between industry and government
9.	pesticides related matters	fertilizers related matter
10.	pesticides related	fertilizers related
11.	of pesticides availability	fertilizers production and distribution

About the Author

P.K. Suri is serving as Professor in the Delhi School of Management, Delhi Technological University. He is originally from 1986 batch of Indian Statistical Service and served as Research Officer in the Department of Tourism and at different levels as Scientist in the National Informatics Centre (NIC), Government of India. He has practical experience of planning and implementing several ICT based projects, particularly in the agriculture and allied sector. He has done his doctoral work on e-governance from the Department of Management Studies, IIT Delhi and has publications in journals and conferences.