

A Model of EGovernance Based on Knowledge Management

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Abstract: EGovernance has not made enough impact on the people as eCommerce and eLearning have done. There are several barriers on the roads of EGovernance. From the software engineering point of view, EGovernance has a lot of characteristics, which are different from eCommerce and eLearning. Unlike eCommerce and eLearning, EGovernance needs to be proactive. While eCommerce and eLearning involve Information Management, EGovernance involves Knowledge Management (KM). Knowledge management is the management of information, skill, experience, innovation, and intelligence.

Our model of EGovernance based on Knowledge Management System (KMS) is built on KM cycle of Knowledge capturing, Knowledge sharing, Knowledge enhancing, and Knowledge preserving.

The development model of EGovernance based on Information Management System (IMS) applies a cycle-based process such as waterfall, spiral or iterative process. EGovernance is a combination of interaction and integration. This paper studies a development model of KMS-based EGovernance that is path-based process. This model provides an environment where the system grows with the people.

Keywords: EGovernance, Information Management System, software engineering and Knowledge Management System.

1. Common Existing Models of EGovernance

Electronic governance or EGovernance is the latest buzzword for governments trying to involve people in administration, address transparency in their bureaucracies, and make themselves more responsive to their citizens. The benefits of EGovernance are faster decision making, reduction of duplication of work, detection of corruption and illegal transactions, prevention of knowledge drain and crisis handling.

The objective of the conventional EGovernance is to help citizens in (i) paying utility bills (telephone, water, electricity, etc.), taxes and so on, (ii) handling registration formalities for land ownership, marriage, birth, and death (iii) processing application forms and renewals of driving licenses, work permits and passports (iv) lodging complaints. The EGovernance will cut the frontiers of time and space. It helps citizens to access information at anytime, at any place using net-enabled system. The object of the conventional EGovernance is a set of documents which may be rule books, guidelines, files, applications, circulars, government orders, memorandums, letters, archives and classified information.

This model of EGovernance has two independent components: (i) Administration and (ii) Citizen & Government. The administration component has two major subdivisions, which are inter-department and intra department. In the same way the component of "Citizen & Government" has two major subdivisions such as citizen to government and government to citizen.

1.1 Administration

EGovernance entails an Intranet for secure, authenticated inter/intra departmental electronic data interchange. Decision-making and activities of a government of intra department are hierarchy-based. There are two kinds of hierarchies in intra department: official hierarchy and regional hierarchy. Inter-Department activities are such as Sharing of information, Mutual cooperation, and Monitoring and assistance.

1.2. Citizen and Government

The financial aspects of Citizen-to-Government are taxes, utility bills, penalties, and toll money etc. The non-financial aspects of Citizen-to-Government are voice of the people, memorandum, requests, and general elections etc.

The financial aspects of Government-to-Citizen are loans, relief funds, dole money, B2C transactions, B2B transactions (eCommerce). EGovernance provides comprehensive B2B / B2C capabilities that connect small-scale industries, traders, farmers and their customers in a cost effective and timely manner. The non-financial aspects of Government-to-Citizen are education and training (eLearning), opinion polls, survey, intelligence and reports. EGovernance can harness the internet and cable networks to spread quality education and training across the country.

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2 Overview of the Paper

From the perspectives of software engineering, EGovernance is a combined process of *integration and interaction*. Billions and billions of bytes of information find their way into this system by users. It requires sound technology and infrastructure to effectively access and use this ever-growing information and knowledge database. EGovernance needs to maintain a powerful integrated hardware and software network. This is the *integration part of EGovernance*. A country is made up of government and people. People are made up of communities. A good EGovernance model provides a platform where various communities and special interest groups (SIG) represent themselves. It provides an easy way for individuals to find the groups and communities of interest to them. It links people and organizations with each other. It builds an environment with specialized expertise that can help answer questions, and guide them to find solutions. This is the *interaction part of EGovernance*.

The existing model of EGovernance (discussed in Section 2) does not fully represent people and their needs. This article discusses and analyzes various parameters involving integration and interaction of EGovernance. A model of EGovernance based on Knowledge Management System is investigated. This model will help engineers who architect EGovernance applications. There are several technical barriers to make people accept this new media. One important factor of the success behind EGovernance is the efficiency of user interface design.

It was the age of Data, then the age of Information. Now it is the age of Knowledge. We study the differences of the three eras from the perspective of software engineering. We also discuss the implementation barriers of KMS-based EGovernance.

We study the differences between the IMS and KMS of EGovernance. The software engineering process of Information Management System of EGovernance is cycle-based. We discuss a path-based development model, which is more appropriate for Knowledge Management System of EGovernance.

3 Our Model of EGovernance

A country is made up of government and people. People are made up of communities. A good EGovernance model provides a platform where various communities and special interest groups represent themselves. It provides an easy way for individuals to find the groups and communities of interest to them. It links people and organizations with each other. It builds an environment with specialized expertise that can help answer questions, and guide them to find solutions. This is called *community management system* of EGovernance. See Figure 1.

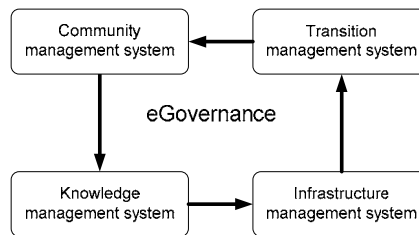


Figure 1: A model of EGovernance

EGovernance is a transition process from conventional to people-oriented proactive electronic system. This is a big change in the mindset of people. Putting it in a positive way, it is not a change but a transition. It may not be achievable unless it slowly evolves among the people. All communities of people should be attracted towards the system. To accept this transition process, the communities need to be trained and educated. The electronic media should be user friendly and accessible by different communities including the disabled and the under-privileged. This is called *transition management system* of EGovernance.

Knowledge Management System (KMS) is built on KM cycle of Knowledge capturing, Knowledge sharing, Knowledge enhancing, and Knowledge preserving. Knowledge sharing is a crucial phase of KMS-based EGovernance. A *knowledge management system* of EGovernance provides an environment where knowledge flows smoothly from a source with knowledge to a destination that needs knowledge.

Several millions bytes of information find their way into this system by users. It requires sound technology and infrastructure to effectively access and to use this growing information and knowledge database. EGovernance needs to maintain a powerful integrated hardware and software network. This is called *infrastructure management system* of EGovernance.

Community Management System

A country is made up of heterogeneous communities. Community includes various special interest groups, like-minded factions, forums, institutions, social and cultural organizations, business establishments, departments, and administrative hierarchies. There are an ever-increasing number of development organizations that want to have online groups or communities. This brings cultural change both within the government itself and in the overall society.

EGovernance is a partnership of people and administrators. In a conventional administration, the administrators are proactive and the people are reactive. A successful EGovernance induces both government and people to be proactive and interactive. The success depends on how people are made involve and commit in the process of planning, decision-making, and administration. In a good model, administrators and lawmakers are also considered as one of the communities of the system. The stakeholders of EGovernance are the communities. Our model of EGovernance provides a platform where government and people come together to play proactive roles to discuss burning issues, to suggest new methodology, to analyze new technology, to commit to new system or to accept necessary social reorganization. EGovernance is a vehicle to create knowledge society, which would lead to improvement of common man.

The community management is influenced by proactive management of the communication process of vertical and horizontal structure of communities. The starting point of the community management is fostering groups and communities in national and international development. The community management is a partnership, which caters to both individuals and organizations by offering tools and services that bring people together.

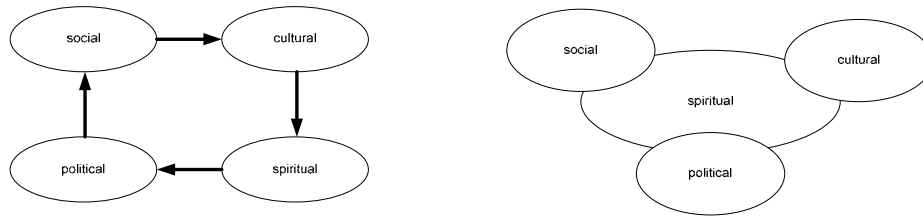


Figure 2: Community Management System

A broad classification of communities is social, cultural, political and spiritual. However, there are two kinds of interaction among themselves. See Figure 2. There are countries where the four domains are rather independent and autonomous. On the other hand, there are countries where the social, cultural and political domains are circled around spiritual domain. These are hierarchically classified into smaller communities.

A good model of EGovernance supports all social activities of a community with the capacity to do in an environment, which is simple, non-commercial, respectful of privacy, and targeted at all sections of citizens:

1. It is principally to grow communities, and in particular the community of facilitators and SIG leaders within it; as these roles are crucial in establishing a successful community. The system provides tool so that a community can register themselves to create a home and can maintain self-controlled areas. This will be a meeting place for people sharing an interest in a restricted and private environment.
2. It links people and organizations with each other and with specialized expertise that can help answer questions, and guide them to solutions.
3. It creates a platform that provides an easy way for individuals to find the groups and communities of interest to them.
4. It includes coordination of the activities of the various areas of the site and events of communities.

Transition Management System

Transition management is all about how the stakeholders of EGovernance, which are the various communities, make transition from traditional approaches to new means of electronic process. Transition management (Riley, 2002) is a subject matter that is currently sweeping public and private sector organizations. It is not new but has been evolving as a discipline over the past decade. Transition management is addressing the changes being faced by modern public administrators, both internally and externally. In the past three decades, governments have had to contend and deal with, many societal transitions that have significantly altered the way public administrators function in their jobs. Globalization, free trade, the increased movements of people and goods, changing social attitudes and new technologies especially information and communication technologies, have all contributed to the challenges now facing rulers and people alike. Thomas Riley (Riley, 2002) calls it change management.

A proactive approach of Transition management is to define and resolve personnel and cultural issues that may inhibit successful evolution. This is also called proactive management of EGovernance. This may become positive forces in helping EGovernance to evolve.

Transition management will become central to many of the above issues. However, how public sector officials adapt to these new environments, which require transparency, accountability and openness will become crucial to the success of EGovernance. This is part of a major transition that is compulsory to reflect the current social and cultural shifts occurring in society. Transition management is one such tool to achieve this goal. However, the success of how we will handle our future lies in the involvement of people who will be willing to accept and work in our new environment.

A success of EGovernance very much depends on the success of the front-end design. The common man in a country continues to be largely unaware of the potential of IT in daily life. Thus EGovernance needs to take proactive measures to attract the citizens and make them accept the new media. One important factor of the success behind EGovernance is the efficiency of user interface design. We need to discuss various parameters of user interface design of EGovernance, which are mainly relevant to common man including disables and illiterates.

A good model of EGovernance puts simplicity at the front-end and complexity at the back-end:

1. It supports knowledge sharing networks on issues like training, evaluation, community access centers, and education.
2. It provides user-friendly electronic media. It is easily accessible by different communities including disabled and under-privileged. User Interface Design will be a high priority so that all communities of people will be attracted towards the system.

Knowledge Management System

Historically it goes like this: the age of data, then the age of information and now the age of knowledge (Ackoff, 1989; Davenport, 2002; Devlin, 1999, Kock, 1997). Data is a representation of facts. Information is an interpretation of data. Knowledge is an application of Information.

Data Age and Information Age:

Until the 1970s, it was considered as the age of data when people were happy with the data management system (DMS). Then it was the age of information when people were excited with the revolution of information technology. Let us look at the differences between data and information from software engineering point of view.

Architecture:	DMS is single tier where as IMS is n-tier architecture.
System:	DMS is homogenous where as IMS is heterogeneous.
Design Model:	DMS is about how to maintain data where as IMS is about how to interpret data.
Development Model:	DMS focuses at the back-end where as IMS focuses at the front end.

Information Age and Knowledge Age:

What is the difference between Information and Knowledge? "Which portfolio is doing well in equity share market of Wall Street?" The answer to this question is information. "I have 1 million dollars. How do I invest this money in Wall Street?" The answer to this question is knowledge. Knowledge is an interesting combination of information, skill, experience, trust, and intelligence. Capturing knowledge is a challenging task of computer engineers. Knowledge Management System is an interesting research topic for computer scientists in the coming years (Malhorta, 1998).

Let us look at the differences between information and knowledge from the perspectives of EGovernance. Suppose there is a system, which simulates World Trade Organization (WTO). Recently USA Senate passed a Bill that restricted IT contractors from sub-contracting Government projects to firms in other countries. Countries like India planned to complain to WTO that it was against the spirit of free trade. WTO is an organization like UN to mediate trade disputes between two groups. Mediation or adjudication involves rulebooks, experience and understanding of sensitive environmental issues. An IMS-based EGovernance does not handle these kinds of subtle issues. However, one of the responsibilities of a KMS-based EGovernance is to play a role of a mediator.

This paper discusses the software engineering aspects of KMS-based EGovernance. We pointed out in the beginning that there are several models of IMS-based EGovernance. We highlight that the principles and philosophies of IMS are not applicable to models of KMS-based EGovernance.

Project:	IMS focuses on the <i>development</i> of the project where as KMS of EGovernance focuses on the <i>maintenance</i> of the project.
Requirements:	IMS is well defined and well structured (can be expressed in the SQL statements) where as KMS of EGovernance cannot be organized and classified.

Driver:	IMS is business-driven controlled by one team with defined business objectives where as KMS of EGovernance is people-driven.
System:	IMS is a homogeneous project with heterogeneous systems where as KMS of EGovernance involves heterogeneous projects over hydrogenous systems.
User Interface Design:	The GUI layout of the communications and reports of IMS targets stakeholders who are well defined at the requirements phase itself where as the user interface design of KMS of EGovernance targets undefined and unknown users.
Architectural Design:	IMS is based on <i>integration</i> where as KMS of EGovernance is based on <i>assembling</i> . An IMS based project is modularized into smaller projects with well-defined interfaces and thus it is a process of integration. A KMS based EGovernance project is a combination of multiple projects and it is a process of assembling.
Process:	An IMS project is a <i>cycle</i> -based process. It is software development cycle of various phases from requirements engineering to transition. A KMS of EGovernance is a <i>path</i> -based process. We discuss this path-based process in detail shortly.

A path-based process:

There are models to represent knowledge (Deen, 2003). A good model of knowledge management system is a blend of evolution and innovation. The KM (Haggie, 2003; Riley, 2003; Spek, 1997) cycle has 4 phases:

- Knowledge capturing (creation)
- Knowledge sharing
- Knowledge enhancing
- Knowledge preserving

How do we differentiate between IMS-based EGovernance and KMS-based EGovernance from the perspectives of software process? Let us consider an IMS of EGovernance of Quebec, Canada. In 1990, if you ask an IMS regarding Quebec sovereignty referendum “Does Quebec want to separate from Canada?”, it would reply “NO”. But it would give the same answer in 2000 and continue to reply in the same way in 2010. In the real scenario, the mindset of the people of Quebec has been changing. There has been a consistent drift from “NO” to “YES”. We need a system that changes according to the change of the mindset of the people. We need a system that reflects the changing attitude of the people. We need a system that grows with the people. In other words, we need a system that would reply “NO” in 1990, that would reply “Between YES and NO” in 2000 and that will respond in a different way in 2010 according to the mindset of the people of Quebec in 2010. Only knowledge-based EGovernance provides this.

The popular process models of software development life cycle are waterfall, spiral and iterative. In the cycle-based process of IMS of EGovernance, the development phase and the maintenance phase are in different stages. The maintenance phase begins after the completion of the development phase. The period of development phase is very small compared to the maintenance phase of a software development life cycle. This cycle-based process is not appropriate for KMS of EGovernance. The development phase and the maintenance phase of KMS of EGovernance should go hand in hand. Both phases should proceed endlessly on parallel paths. Figure 3 represents the path-based process of KMS of EGovernance. In this path-based process, the development phase and the maintenance phase are two parallel activities. The development phase is a sequence of software development life cycles, which involve development projects.

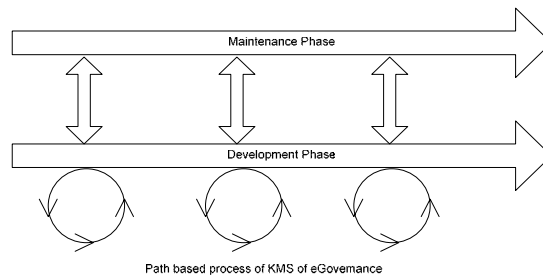


Figure 3: A path based process

A good model of EGovernance will have the following features:

1. Information management (Computer Associates, 2003; Riley, 2003): This includes *knowledge preserving*. The system stores and retrieves the data, documents, and records of government. The system is smart enough to extract statistical and intelligent forecast reports for future planning.

2. Events Management (Binney, 2001; Day, 1998; Zack, 1999): This includes *knowledge capturing*. The system provides a platform for discussion, debate, snap poll, referendum for the communities. The goals are to provide flexible collaborative environments with targeted services for the different parts of the community, to support interactions between organizations and research networks where new social issue or need or change is floated, defined and analyzed. The outcome of these events are stored and forwarded to appropriate destination.
3. Privacy Management (Riley, 2002): The system is designed in such a way that the privacy of discussion, debate, snap poll, referendum is strictly maintained. Necessary copyright and intellectual property is taken care.
4. Capabilities Management (Binney, 2001; Day, 1998; Zack, 1999): This includes *knowledge sharing*. The system uses Knowledge Sharing approaches to assist development organizations in sharing their capabilities, experiences and knowledge with the goal of increasing the effectiveness of development work overall. The aim is also to support and nurture collaboration within individual organizations as well as the development community as a whole. It will also promote a range of services to offer to its members and other interested parties such as training, consulting and facilitation.
5. Creativities Management (Binney, 2001; Day, 1998; Zack, 1999): This includes *knowledge enhancing*. The system provides a platform where multiple perspectives have an opportunity to interact, where different disciplines cross one another, where good is challenged by bad, rich is challenged by poor, and revolutionary ideas are challenged by conservative ideas. The system encourages social activists, researchers, business people and knowledge workers from all sectors to join there to create some real innovative breakthroughs in technology, new organizational forms and methods, new leadership skills, new collaborations beyond age boundaries, beyond discipline boundaries, and beyond sector boundaries.

Infrastructure Management System

Infrastructure Management (Computer Associates, 2003) is well studied under Enterprise Resource Planning. The infrastructure management (Madhavan, 2003) covers the following domains:

1. Security management: Security holds the key to successful EGovernance by safeguarding each electronic data interchange.
2. Software management: Software is one of the most critical elements of the system. It involves huge efforts in the development life cycle. The focus of software management system is the organization, control, and protection of software assets within the communities of EGovernance.
3. Network management: EGovernance integrates multiple domains running on different computers, and uses distributed database technology and provides a high performance platform regardless of the size or configuration of each network. It supports management of multiple distributed domains. Here domain represents a community from the perspectives of EGovernance. It should be a secure, scalable, distributed software suite for managing mission-critical network of EGovernance.
4. Resource Management: This includes procurement, inventory management, software distribution and hardware release management, license management, configuration management, capacity planning, and optimization of the infrastructure.

Since enough expertise is available on the infrastructure management system, the research scope of this article does not intersect the infrastructure management system.

4 Conclusion

The conventional IMS-based EGovernance use a concept of “knowledge centers” to share knowledge. Our model of EGovernance based on knowledge management system is built on KM cycle of Knowledge capturing, Knowledge sharing, Knowledge enhancing, and Knowledge preserving. This model shares knowledge that supports the law of knowledge dynamics.

The development model of IMS-based EGovernance applies a cycle-based process. EGovernance is a combination of interaction and innovation. This paper studies a development model of KMS-based EGovernance that is path-based process. This model provides an environment where the system grows with the people.

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