

Reanalysing the Socio-technological Interoperability Issues of e-Governance

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ABSTRACT

e-Governance is the application of information and communication technology for delivering government services. The government-enabled services are availed by stakeholders through government portals. The interoperability issues are identified by all e-governance services. To achieve public services through a single point provided by different authorities will require integration of process, data and technology at the backend. The government information network will be established when systems of partner organisations are interoperable. The performance of government information network depends on the extent of adoption and compliance with the necessary standards by the partner organisation. This paper highlights the socio-technological dimension of interoperability to investigate the challenges faced by developing nations in adoption of the standards of interoperability and proposed solutions which can be incorporated to provide effective and efficient e-services.

Keywords: capability dimensions, e-government, interoperability

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INTRODUCTION

Interoperability framework is the basic standard which all government agencies adopt for implementing e-government strategy. This framework allows communication between information systems from different agencies to provide services to citizens in integrated way. Interoperability will provide single-point access to all stakeholders. High level of integration of processes and e-government maturity are required. High level of e-government maturity will manifest in one-stop government portal. Citizens download the application form for a variety of services. From the last two decades, there is emphasis on shifting from public sector reforms to New Public Management reforms leading to Whole of Government (WG) approach. There are five interrelated objectives based on which the stepwise evolution of e-government can be examined. These objectives are policy, citizen-centric public services, high

precedence level of government operations, citizen's involvement in democratic set-up, and administrative reforms.

It is of prime importance to understand how to link ICT and governance processes to establish an interdisciplinary framework of interoperability. The improvement in public services and getting the information system aligned accordingly becomes the basis of institutional policy. In general, public-value-based evaluation must be performed by considering the value that citizens perceive in their interactions with public administration. Discussing the value of ICTs for public administration, Bannister [3] underlines that the definition of value reflects the fact that citizens interact with public administration playing different roles. We can extend this idea to the relationship between public administration and the wide spectrum of its stakeholders, such as private organisations, NGOs and suppliers.

The framework should not only be technological oriented but organisational need specific. There is greater possibility of misalignment of policies, strategies and operations which should be avoided. According to UNDP e-Government Interoperability Study Group, there are three *strands* to interoperability: technological, semantic and organisational.

Technological Interoperability

This includes both hardware and software issues. The former mainly concerns connectivity and protocols (e.g., TCP/IP), while the latter concerns a common syntax (e.g. XML) for data, and standards for messaging (e.g. SOAP and WSDL). A technological interoperability platform allows two organisations to reliably exchange messages, but the actual understanding of message content remains outside its scope.

Semantic Interoperability

This is the ability of different information systems to understand the data exchanged in the same way by following some convention. There is clarity and no ambiguity in exchange and use of information between two or more applications. Semantic interoperability in e-governance is a challenge because interoperability deals with many electronic documents related with different best practices, administrative process, regulations and languages. Electronic documents are linked across boundaries and it is prone to difference in interpretation. Therefore, achieving semantic interoperability has great significance.

Organisational Interoperability

Organisational interoperability is concerned with reaching the level at which different organisations work in unison by adopting best practices and various methods of managing change. It deals with collaborating with other organisation and aligning business processes to achieve agreed e-government objectives. Better

integration of government services is possible by synchronising the business processes. Platforms, such as ebXML, the open-group architecture framework (TOGAF), define the business architecture which has eight iterative steps, or e-Government Interoperability Framework (e-GIF) can be adopted to attain interoperability.

E-GOVERNMENT AND INTEROPERABILITY

For attaining the outcome of citizen-centric government operations, interplay of government information resources and processes and particularly integration of independent information systems is essential. Integration and attaining interoperability face many challenges. Interoperability requires information sharing among government entities. Of all the challenges, the technological challenge can be addressed easily while legal, political and organisational challenges appear more difficult. IT managers play important role in contributing to the cross-organisational integration as well as in developing course of actions to achieve interoperability. An audacious guiding vision is required to achieve interoperability. Interoperability framework was one of the most important e-government strategies outlined by administrations of most OECD countries during 1990s.

Cava and Guijarro [2] analysed the results of the Shared Infrastructure Working Group (SI-WG) of the E-Forum Association. This group constituted members from private and public sectors as well as academicians.

This vision of integration has sparked many projects and research on how to realise e-government websites based on “life-events” or “one-stop government”.

Improvements in the areas of administrative efficiency and effectiveness will lead to increased integration of

performance of administrative units about IT devices.

Information integration emphasises on flow of information and provides access to structured information resources leading to services on virtual information environment.

Jhingran et al. [4] describe information integration as one of the forms of integration, “wherein complementary data are either physically (through warehousing tools) or logically brought together, makes it possible for applications to be written to and make use of all the relevant data in the enterprise, even if the data are not directly under their control”.

It is important to realise that interoperability demands a guiding vision for interoperability and strategic commitment to understand various form of cross organisational aspect.

RELEVANCE OF ENTERPRISE ARCHITECTURE IN E-GOVERNMENT

Enterprise architecture is a strategic management tool which helps to link business processes with ICT. Enterprise architecture as an ordered activity helps in positioning business and ICT. It describes how people, process and technology in an organisational unit act. Enterprise Architecture (EA) can be defined as the “blueprint that documents all the information systems within the enterprise, their relationships, and how they interact to fulfil the enterprises mission”. For e-governance success, interoperability and integration of information system are important. To achieve interoperability, the local government and state government should not have different design principles because enterprise architecture encompasses analysing documents from an integrated strategy, business and

technology perspective. The analysis of the issues related to integration of local and state governments from the perspective of complex adaptive system (CAS) suggested by Janssen and Kuk [6] consist of network of highly interactive and independent entities. From the CAS point of view, the main challenge is creation of enterprise architecture. The CAS system helps in designing architectural design principle. Deficient enterprise architecture is a barrier in accomplishment of successful e-government. Architecture-based standard is the requirement for integration and interoperability of various citizen services at state and central government levels. Ylimäki [8] analysed the critical success factors of enterprise architecture in relation to total quality management which highlights the aspects needed to offer quality service.

MATURITY MODEL

Interoperability requires information sharing among government entities. The evaluation of readiness of public agencies are very important as they are encouraged to join e-governance initiatives to provide better benefits. It is “the sum of all things that enable an organisation to deliver services”. It is a technical concept of software and information system. Maturity models explain how capability must be created to achieve the goal. Maturity model of e-government was developed integrating the assessment of technological, organisational, operational and human capital capabilities under a multi-dimensional holistic and evolutionary approach. The model provides tuning mechanism to enable its alignment with nationwide directives on e-government. Maturity model of e-governance allows the public agencies to be evaluated against the best practices in e-governance including formulation of organisational strategies and policies,

management of ICT operative management, and organisational human resources and the organisation over all [7].

Gue'dria et al. surveyed five major models of capturing the maturity of software and information systems and identified that technical models of maturity encompass social factors such as business process and governance. The survey was data, processes and business oriented. Two models serve as examples in this regard. The e-Government Maturity Model of Iribarren has three dimensions that address non-technical, business process maturity: information criteria, IT resources, and leverage domains such as e-strategy, IT governance, process management and human and organisational capabilities. The Government Interoperability Maturity Matrix from Sarantis includes government process and alignment, compatibility with e-government, legislative issues, interoperability at different levels of government, and the existence of common data schemas. An e-government maturity model provides us with guidance on how to gain control of our processes for developing and maintain e-government services and how to evaluate towards a culture of excellence in providing and managing e-government.

INFORMATION SYSTEM

One of the key benefits that citizens expect from e-governance initiatives is a single-window access of government services. To achieve this, there is a requirement of seamless data sharing across applications. Standards like XZML, SOAP and web services are required. Data accessibility and security is of prime concern for government today. The socio-technical perspective is also gaining momentum from the information system.

Researchers have found that not only technology is the only constraint but constitutional, legal, collaborative,

organisational, informational, managerial, cost and performance are also important constraints. The European Commission's framework for Pan-European e-government services presents three types of interoperability: organisational (joint decision, decentralised responsibility, business processes, agreement on interfaces, formalisation of agreement, and security policy), semantic (common definition, agreement of data elements, and linguistic equivalence), and technical (front-office issues such as access, back-office issues such as integration and architecture, and common concerns of security). The Australian government offers six domains of technical interoperability: security, interconnection, data exchange, discovery, presentation and metadata. The UK e-GIF includes technical policies, management processes, change management and compliance mechanisms for the e-GIF [5]. The New Zealand e-GIF highlights standards (for access and presentation, business service, data integration and networking) and policies (stewardship vs. information use, governance, and project and operational management). The United Nations Development Programme.

Compares different versions of e-GIF in terms of three criteria: technical content, authoring process, and implementation and compliance.

DIMENSIONS OF INTEROPERABILITY CAPABILITY

Based on the above research, the categories of interoperability framework were identified as represented in Table 1. These categories of interoperability framework led to the development of multi-dimensional framework of interoperability capability which includes dimension of business architecture, governance and leadership, strategic management, operational management, information policy, cross-organisational collaboration, and technological readiness.

Business Architecture

This category has only one dimension which deals with the business modelling leading to become a basis for interoperability and deals with linking all the processes through information system. Deficiency in architecture becomes barrier to interoperability. Business architecture is design and technology decision guided by business model and perspectives. Boster et al. [1] suggested that target architecture

can be developed only after establishing baseline architecture which describes the present status of the organisation and then transforming it to target one by planning for implementation. Better communication will help to understand the advantages. The factors affecting the long-term benefits become the barrier and is a challenge. The benefits realised can help researchers to realise the value addition and help in making business case.

Table 1. Multi-dimensional framework of interoperability capability (Pardo et al., 2013).

Categories	Dimensions
1. Business architecture	Business architecture
2. Governance and leadership	Governance Leaders and champions Stakeholder engagement
3. Strategic management	Strategic planning
4. Operational management	Project management Resource management
5. Information policy	Information policy Data requirements
6. Cross-organisational collaboration	Collaboration Readiness Organisational compatibility
7. Technological readiness	Secure environment Technology acceptance Technology knowledge Technology compatibility

Governance and Leadership

This category outlines three dimensions of governance: leaders and champions and stakeholder's engagement. Governance emphasises on making the government services citizen oriented and making clear roadmaps by the authority. Governance presents framework for decision and accountability to encourage desirable behaviour in the use of resources. Proper leadership helps in capacity building, and lack of leadership and champions will become barrier in information sharing.

Stakeholder analysis is an integral part of managing an e-government initiative.

Strategic Management

This category has two dimensions: strategic planning and performance evaluation. Strategic planning will be based on clear-cut vision and goal. Futuristic strategy will depend on the benchmarks attained by the initiatives. The identification of critical success factors and breaking them into measurable indicators will help in performance

evaluation of e-governance initiatives. It is important to assess the e-governance initiatives and the performance evaluation done based on the critical success factors. A summation index, e-governance assessment index developed by Jha and it was derived based on critical success factors and key performance indicator to develop understand the importance of one factor on the other. The score so obtained will help in assessing the e-governance initiatives and developing the standard compatible to all projects. The summation index developed will help in assessing the initiatives and identifying the intensity of stakeholder's participation. A proper strategic management will help to attain compatibility between the initiatives and will lead to make integration of processes easy.

Operational Management

Operational management include two dimensions: project management and resource management. The main concern of e-governance is the management of e-governance initiatives which requires management across organisations including technical skills and assess project management process. Resource management is concerned with identifying capability to identify, acquire and manage resource necessary for interoperable e-government including financial, human and technical assets.

Information Policy

Information policy category includes two dimensions: information policy and data requirements. This category deals with the data management and takes care of how the information will be collected and disseminated. This category focuses on the various ways of data protection as well as ways to counter security breach. Data requirements as a capability dimension consider the extent of identification and specification of formal policies for data collection, use, storage and handling, as found in documentation of databases, record

systems, data quality standards and dictionaries.

Cross-organisational Collaboration

Cross-organisational collaboration category has two dimensions: collaboration readiness and organisational compatibility. Cross-organisational collaboration is about making joint decisions. Collaboration-ready organisations have a track record of successful collaboration and actively seek out new opportunities for partnering across organisational boundaries. Capabilities in this category increase the likelihood that organisations, who are typically distinct in terms of their disposition and readiness for collaboration with others, can succeed in their interoperability efforts. Collaboration readiness is evident when organisations have cross-organisational compatibility, which is defined as the degree to which the work styles, interpersonal relationships, participation in decision-making, levels of competition and collaboration, styles of conflict resolution, and organisational cultures support information sharing.

Technological Readiness

Technological readiness comprises four dimensions: secure environment, technology acceptance, technology knowledge and technology compatibility. The secure environment deals with the various ways of obtaining data security and reliability, appropriate security protocols of data, applications, systems and networks exist, and whether the policies, training and management practices to support them are in place. Technology acceptance deals with the adoption of technology, degree of involvement among staff and technological innovations in organisation participating in an interoperability initiative. Change should be properly valued in terms of organisational acceptance and satisfaction.

Implications for Research and Practice

The multi-dimensional capabilities provided in the paper can contribute in

improving government interoperability. The degree to which the organisations utilise a set of capabilities will itself help in assessing the interoperability. This framework can become model for comparative study of interoperability initiatives. Using the capability dimension of multiple agencies can provide insight to determine the interoperability maturity and related gaps.

CONCLUSION

Interoperability can be considered as an enabler for helping government to improve services and operations by saving money and time. The government can provide services which will be citizen oriented and offer one-stop solution. The interoperability in e-government is one of the critical success factors of e-governance. The capability dimensions will vary with the initiatives and degree of relative importance of one dimension on the other if identified will help to make strategy for adoption of interoperability standard of e-government initiative.

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