Application of XML services in Indian e-governance portal: Improving Interoperability, Simplicity and Versatility

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Abstract: With the growth of Indian population, the complexity to manage Government administration is increasing day-by-day. Indian Government has developed various e-Governance projects to manage the government services through the several e-Governance portals. Most of the cases these portal solutions are department centric that is one solution for a particular department. Now, it is being very urgent to do process Re-engineering in Government administration to manage inter - departmental dependencies in information sharing. Information in XML format can be useful to achieve these complex inter-departmental dependencies due to its unique features like simplicity, openness, extensibility and self description etc. It contains machine readable context information, separate content from presentation, support multilingual documents and Unicode, can embed multiple data type, can embed existing data and provide one server view for distributed data. Uses of different kind of database in different e-Governance portals make problem to transform information sharing among different data bases. The main object of this study is to improve cross application interoperability of e-Governance projects to reduce its application coupling and to enhance the scope of its applications using XML service. A framework has also been proposed to show the secured data transmission process in XML format across the various e-governance portal as well as e-governance portal to various commercial applications with the help of web services provided by different vendors.

Keywords: XML, INTEROPERATIBILITY, SEMI STRUCTED DATABASE, E-GOVERNANCE, TECHNOLOGY ACCEPTANCE MODEL (TAM), WEB SERVICE, PORTAL

1. INTRODUCTION

E-Governance is the implementation and delivery of governmental citizen centric services through the Information and Communication Technology (ICT) to provide efficient, effective, transparent, responsive and accountable governance to the society. The concept of e-Governance is being implemented in various government departments in India for last two decades to provide services to the common citizens. With the approval of National e-Governance Plan (NEGP), comprising 27 Mission Mode Project (MMP) and 8 components, on may 18, 2006 [13], Government of India (GI) has accelerated its motion for long-term growth of e-Governance within the country and showed their long-term commitment to provide better governance with reduced corruption, efficient and effective process flow. GI has set up National Informatics Centre (NIC) to promote informatics culture in the Government Departments and develop computer based Management Information to exchange information between the Districts and the States and then to the Central [8]. Primarily NIC websites provides all e-Governance services portal links as a communicator [12].

With the success of various e-Governance projects, Citizen's expectation is also growing day by day. The GI also is framing new e-Governance projects to fine tune the existing one to meets the citizen's demand and their increased expectation. In India, Government departments are inter-connected in terms of government activities so that the results of transactions from one department can be interchanged with another department [8]. In general, Local and Central systems are expected to connect and communicate with each other for smooth functioning. Now it's required to integrate all the scattered systems for better co-ordinations between governmental intra-departments and inter-departments. Physically, this may be integrated as a central database or may be a connected web of databases, communicating with each other. XML could be a common format to exchange the information across the intra-departments and inter-departments because XML specify a unique format which can be universally understood. The format could be a document of text, multimedia, relational data and financial data [9]. XML having featured like simplicity, openness, extensibility and self description etc. It contains machine readable context information, separate content from presentation, support multilingual documents and Unicode. It also provides features like embedded multiple data type, embedded existing data and one server view for distributed data. XML can improve interoperability between Government departments and agencies' applications by exchanging structured data, sharing metadata, provisioning and collecting metadata, sharing and / or integrating business

process, sharing documents, sharing images, sharing multimedia information. It has huge potential in coordinating multiple applications not only within an Organization but also across Organizations. Our purpose is to use these XML features to facilitate the interoperability among e-governance portals, government agencies, including their vendors and customers.

In a nutshell, below are the benefits that are expected from XML service in e-Governance portals:

1. Provide Government Organizations the ability to share information by use of common XML standard.
2. Adoption and usages of Web Services to interchange data across government intra and inter departments in XML format.
3. Reduce the e-Governance applications coupling and enhance the scope of applications.
4. Ensure the secured and fast data transmission across the network.
5. Provide cost effective e-Governance services to the citizen's and agencies' by reducing the redundant and inconsistent data, maintained due to heterogeneous Database in different government data sources.

2. LITERATURE REVIEW

Mrinalini Shah (2007) has discussed about the requirement of different intra-departments and inter-departments collaboration by sharing the information in Indian e-Governance dream or reality [8]. In the year 2008, Saxena Meetali described the impact of technologies on the practices and administration of Governments and the relationships between public servants and society [6]. Authors also explored how e-Governance initiatives of Government of India transformed the rural masses and the changing face of Rural India with the help of application of Information Technology is brought out. Bagga, R. K. and Gupta Piyush identified different aspects of e-Governance approaches in India in 2009. The main study was in critical issues, challenges of e-Governance projects and finally focused on different approach and methodology for project assessment [1]. Lee, Tomas, Hon, C.T and Cheung, David provides a comprehensive XML Schema design methodology and the necessary schema management infrastructure to facilitate e-Government data standardization in the year 2009 [10]. Saekow, Apitep, and Boonmee, Choompol presents a practical approach called "Interoperability Practical Implementation Support or IPIS" to implementing government interoperability in the same year 2009 [5]. Jaeger, Paul and Matteson, Miriam examines the relevance of the Technology Acceptance Model for e-Government websites at federal government level in the United States through an exploratory research study in the year 2009 [4]. Lai, Cora Sio Kuan and pires, Guilherme tested an integrated

model of e-Government satisfaction that incorporated constructs from the Technology Acceptance Model and end user satisfaction in the year 2010 [11].

3. RESEARCH METHODOLOGY

In our present study, we have concentrated on examine the possibilities of using XML technologies to exchange data among different e-Governance portals in India. We have put our sincere efforts in developing conceptual models to fulfill the growing requirements of exchanging information among different government and non-government applications. We have used the above mentioned unique features of XML technology to fit into e-Governance Portals in India. We have proposed two conceptual models, primarily based on XML technologies, to increase interoperability, simplicity and efficiency in information sharing between government intra-departments, inter-departments portals, government agencies applications and other commercial business applications.

Model – I - Application of Web Services between Government Portals and Commercial Applications: This model shows how Web Services can be used to share information among different Government applications and other commercial application of different government agencies and government vendors or customers.

Model – II - XML Adoption among Government Portals: This model shows how XML (Basic XML, Advance XML, Semantic Web, and Semi Structured Database etc.) can be used to exchange information among different e-Governance Portals in India. It can be represented like a one-view server communications.

We have used Technology Acceptance Model (TAM) to verify the acceptability of these models. TAM is used to predict information system acceptance and diagnose design problems by determining different attributes like perceived usefulness (PU), perceived ease of use (PEOU), attitude toward using and behavioral intentions to use etc.

We have conducted survey to collect data for calculating the TAM attributes. A questionnaire was used for this purpose and conducted interactive session among the IT Consultants from 32 Information Technology (IT) Industries in the State, West Bengal, India to gather their experience about use of XML in developing e-commerce and business application to share information between application to application, how XML could be used as Semi structured database to represent one view server. The Survey also was extended to Common citizen's to measure the user acceptance of various e-Governance projects and, to identify the demand of system up gradation in terms of new technology like XML, web services etc.

4. CONCEPTUAL MODEL OF XML ADOPTION

In order to achieve better governance in India, it becomes necessary to provide portal access in terms of information

sharing to all common citizens, Government Agencies and others public commercial Applications. In this situation, e-Governance portals need to be more robust, loosely coupled and highly cohesive. The findings of this study emphasized that the XML technologies can be a solution to reach out all these requirements because it is simply usable, highly secured for data sharing regardless of the underlying network structure or configuration, operating system, communication mechanism, database or implementing language. The exchange of information in the form of XML format ensures the message security by means of client authentication, message integrity, and message confidentiality.

4.1 Application of Web Services Between Government Portals and Commercial Applications

In this study, we have proposed a model in the Figure I to show how Web Services can be used to provide most loosely coupled environment between government and commercial applications.

This model consists of the following components:
E-governance Portal: Government provides citizen-centric services through the e-Governance portals. For example, GI introduced online annual Income Tax Filing through online portal [15].
E-governance portal Database: Each e-Government portal having own separate and dedicated database.

Web Services: Web Services are used to exchange information in XML format.

Requestor Authentication: In e-Governance portal, Web Services authorize the user using proper authorization process before sharing data.
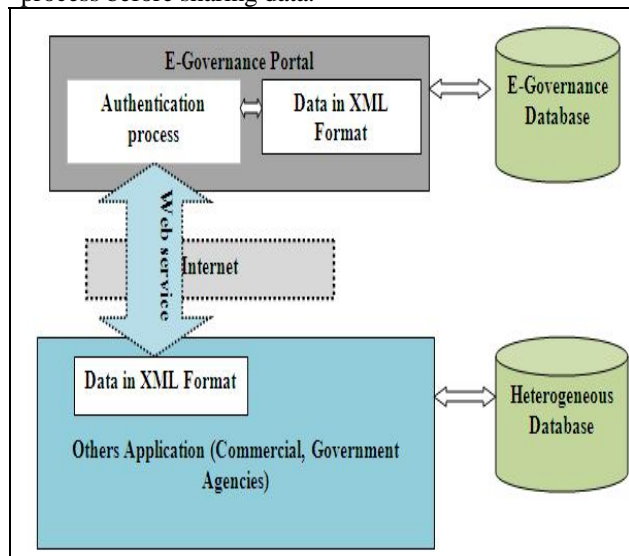

Figure I: Application of Web service

Other Application (Commercial, Government Agencies):

There are so many government agencies and commercial applications which require exchange of information with the government portal.

Heterogeneous Database: Different commercial and government agencies' applications having different kind of data base management system like Oracle, SQL Server, MS SQL, DB2, Sybase etc.

To implement this model in the context of Indian e-Governance portals, each portal will expose individual Web Service for each fundamental functionality. A Portal can expose multiple Web Services depending on the number of functionalities that it provides to its stakeholders. Others applications use communication channels with the portal to exchange information using individual Web Services for different functionalities delivered by the Portal. Portal will do proper authentication process to identify the requester before sharing the information through the web service channel. With the application of web service in Indian e-Governance portal will be able to provide more hassle free service to all.

4.2 CONCEPTUAL MODEL OF XML ADOPTION AMONG GOVERNMENT PORTALS:

 We are proposed another conceptual model in Figure II to show, how XML technology can be integrated to exchange information among different e-Governance portals.
 This model consists of the following components:

Portals: We have considered N number of Portal like Portal A, Portal B, Portal C and so on up to Portal N. Portal A can share information in XML format with portal B or portal C directly and Portal B can share information in XML format with portal A or Portal C. Likewise any portal can share information in XML format with any other portals.

Data Format: Data can be exchanged in any of XML formats like Basic XML, Advanced XML, Semantic Web, and Semi Structured Database.
XML Processor: Meta data in XML format can be processed by the XML processor using XML parsing algorithm, XML serialization and de-serialization methods, X-Query data extraction methods.
Portal Data Ware House: Stores all data in common format to provide one view server.

Figure II: XML in e-Governance Portal

Any portal can share information from portal Data Ware house. So, it presents one view server to all e-Governance portals instead of heterogeneous distributed database practice to exchange information between each others. Now-a-days information sharing in XML format is more secured, fastest and simple. So, XML in e-Governance helps e-Governance portal to be more transparent, effective, efficient and useful to all.
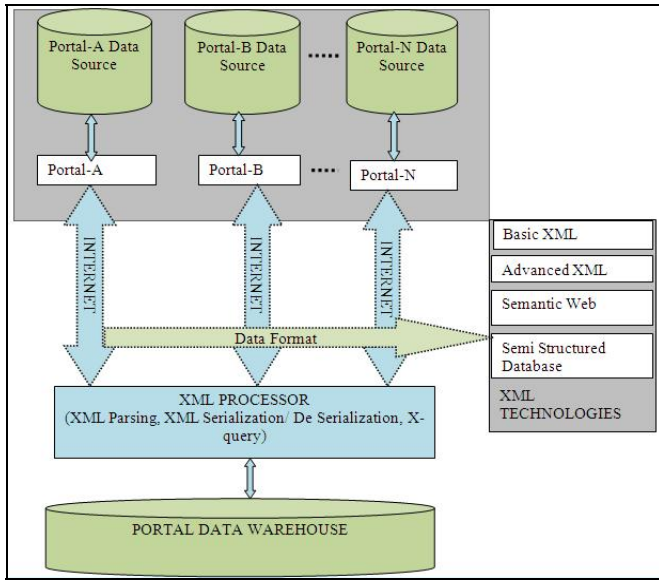
4.3 TESTING: THE TECHNOLOGY ACCEPTANCE MODEL TO USE XML IN E-GOVERNANCE PROJECTS

The conceptual model is tested based on Technology Acceptance Model (TAM), which is used to adapt new technology to measure how the users come to accept and use the new technology. The goal of TAM is to predict information system acceptance and diagnose design problems before users have any significant experience with a system (Davis, 1989). Davis suggested that Users motivation can be explained as perceived usefulness (PU), perceived ease of use (PEOU), attitude toward using, and behavioral intentions to use. Mainly Davis hypnotized that behavioral intention of a user determinant that whether users are going use or reject the system [2, 3]. These tools allow researchers and practitioners the ability to apply stability which has already been developed and empirically validated in previous research, thereby avoiding the potentially time-consuming and costly effort required to develop a new measurement instrument. Thus, the variables presented in TAM offer practitioners a practical, cost-effective method for evaluating new technology and predicting the degree to which end-users will actually use that technology before the system is actually implemented.

The relationship path is used by TAM to meets the user acceptance point are depicted in Figure-III

Figure III: TAM Acceptance diagram

This study has conducted a survey among 32 Information Technology (IT) Industries in the State West Bengal, India and organized some question-answer and interactive sessions with the IT professionals to gather their experience about the use of XML in developing e-commerce and business applications to exchange information between different applications, how XML could be used as Semi structured database to represent one view server. The

Survey also was extended to common citizen's to measure the user satisfaction to accept the various e-Governance projects and, to identify the demand of system up gradation in terms of new technology like XML, web services etc.

Based on the survey and existing research literature, a list of acceptance constructor to use XML in e-Governance projects are identified as-
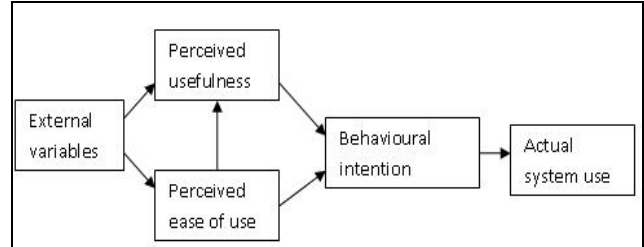

TABLE 1: TAM Acceptance Constructors to use XML in e-Governance portal

Constructors	Definition	Reported Reliability in percentage
Perceived Usefulness	The degree to which IT Practitioners believes that using the XML in web based application will enhance performance	92
Perceived Ease of Use	The degree to which IT Practitioners believes that using the XML will be free from effort.	87
Attitude Toward Using	Feelings of favorableness or unfavorableness towards using the technology.	85
Behavioral Intentions to Use	The strength on one's intentions to use the technology in the future.	82
User Satisfaction	User satisfaction getting XML as common format to share information.	90
e-Governance Adoption	Citizen's acceptance to use e-Governance projects to meets the Government service demand	87
Demand of New Technology in e-Governance portal	E-Governance projects up-gradation demand in terms of new technology like XML, web service etc.	88

According the above discussion, we have proposed TAM research model in the Figure IV.
Hypothesis

This study hypothesize the following factors to find out the understanding factors that cause the acceptance of XML services in Indian e-Governance portal-

H1a: Demand of New technology in e-Governance have major role on perceived usefulness   to integrate XML in Indian e-Governance portal.

H1b: e-Governance adoption growth have major role on perceived ease of use to integrate XML in Indian e-Governance portal.

H2: Perceived ease of use of XML integration in e-Governance portal positively influences perceived usefulness of XML integration in e-Governance portal.

H3a: Perceived usefulness of XML integration in e-Governance portal positively increased user satisfaction in e-Governance portal.

H3b: Perceived ease of use of XML integration in e-Governance portal positively increased user satisfaction in e-Governance portal.

H4: User satisfaction in e-Governance portal has positive effects on Behavioural intention of user.

H5: Behavioral intention of user positively makes possible to integrate XML in Indian e-Governance portal.

Figure IV: TAM Research Model to accept XML in e-Governance Portal
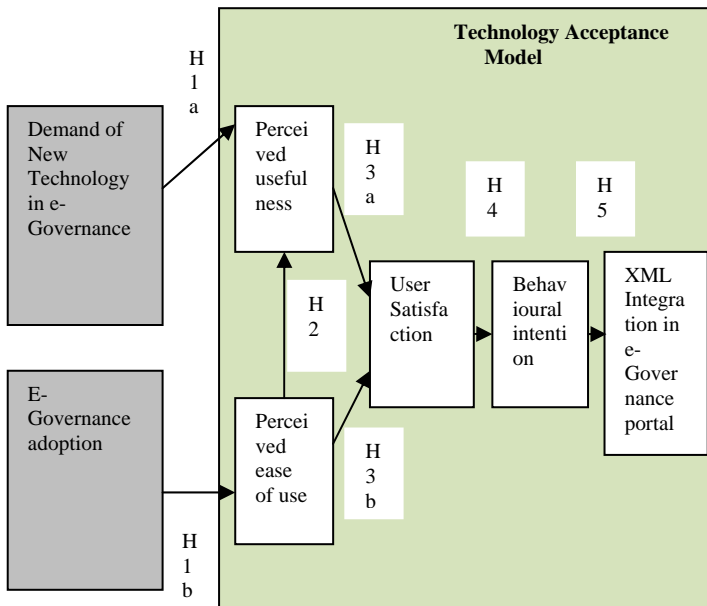
Result:
From the TABLE I and research model Figure IV, it can be summarized that the use of XML in web based application has got tremendous success in terms of Usefulness, ease of use , user satisfaction in IT Industries to share information and, to use as a Semi Structured Database. It's also highlights that the use of e-Governance projects have increased a lot than it was used in last decade and people started demanding to upgrade the e-Governance projects by the new technology to get the more effective and efficient services with more security and speed. Government Agencies and Departmental users want to share information between inter-departments, intra-departments and commercial applications through the internet. Therefore, XML and Web Services could be a solution to meet the all e-Governance portal demands.

5. CONCLUSION AND FUTURE SCOPE

The XML and Web Services having the potential capability to increase inter operability among e-Governance applications in India. In this study, our proposed conceptual models can be useful to integrate XML and Semi structured database in the context of Indian e-Governance portal applications to minimize the application coupling and secured information sharing between the portals. The Acceptability of proposed models are being tested by Technology Acceptance Model and it is found that model should to be well accepted to the common citizens, government agencies applications, government inter-department and intra-department portals.

We need to conduct more survey works to refine the TAM constructors. Also we need to draw some standard XML formats for typical e-Governance information sharing.

6. ACKNOWLEDGMENT

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