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Technological Risks in Developing E-Governance Projects

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Abstract— Information Technology is changing the way the society is working and managing its various functions. The biggest revolution in human history is the invention of Internet. All the Government organizations are also benefitted from this phenomenon. In order to give improved services to its citizens, the government is trying to computerize its various departments. But this won't be possible without the support of Information and communication technology. Huge investments are being made in this area but the success rate is not so high. Thus there are factors that need to be considered while developing such type of crucial applications and proper risk analysis should be done in every aspect. Thus, this paper talks about the technological requirements for developing an e-governance project along with the risk assessment factor playing the most crucial role in its success. It is trying to discuss certain issues that should be kept in mind while developing such type of applications**.**

Keywords- E-Governance, ICT standards, Information Technology, Project Planning, Risk management

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I. INTRODUCTION

E-governance is a term used to denote electronic government which is a digital interaction between two government agencies (G2G) or between government agencies and citizens (G2C). It is basically making use of electronic medium to deliver services to citizens as well as various other organizations. Such initiatives deal particularly with the relationship among public sector, private agencies, service providers, non-profit organizations and civil society institutions. Government agencies are insisting heavily on e-governance projects with the hope to develop electronic systems that provide information, services and tools for the public, businesses and various levels of these systems [5]. The overall trend of Internet and Web based applications is putting increased pressure on the industry to change and recognize this emerging trend [7].

E-governance is far beyond mere computerization of standalone back office operations. It has fundamentally changed the way the government operates, and this implies to a new set of responsibilities for the executives, politicians and other stakeholders involved. It will require basic change in work culture and goal orientation, and simultaneous change in the existing processes. But most important of them is to create a culture of maintaining, processing and retrieving the information through an electronic system and use that information for decision making. [10] The expectations of various stakeholders are associated with these projects. The first and foremost stakeholder is the citizen who looks at these projects as efficient and transparent service delivery system. According to him, these services should have low turnaround time and simple procedures/processes to understand these services or schemes. Second stakeholder can be state or other government organizations who want the effective implementation of the services as per the rules and regulations of the policies so that both the government officials working on such projects (end users) as well as citizens do not face any problem in handling these applications. They should be given proper training as to how to effectively use these web services. Business and other non-profitable organizations can also act as a third stakeholder who seeks these applications for some sanctions and approvals and expect the government to utilize the aids and grants and achieve its designated goals.

Information Technology (IT) has emerged as a key driver in improving the efficiency in the Government Processes thereby facilitating higher levels of service delivery to the citizens and other stakeholders. Additionally, it has also lead to improvement in the effectiveness, accountability and transparency of the Government processes. Electronics and Information Technology is the fastest growing segment of Indian industry. Indian software companies have a unique distinction of providing efficient software solutions with cost and quality as an advantage by using state-of-the-art technology. Through combined efforts of Government and the Industry, Software development and IT Enabled Services have emerged as niche opportunities for India in the global context. The Government has been continuously working upon and making efforts to make India a front-runner in the age of Information revolution. In this context, National e-Governance Plan, (NeGP) has been designed by Government of India. The main objective behind this is to increase transparency, efficiency and effectiveness in delivering services to the citizens. Government of India has identified certain core projects, which are central subjects like Passport, Income Tax,

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and various other projects within the domain of state as well as central government. These projects are known as Mission Mode Projects, which need to be implemented on a priority and mission critical basis. The need for capacity building has given rise to the necessity of having an institutionalized framework within the administrative structure which shall be devoted to the cause of envisaging, conceptualizing, implementation and proliferation of e-governance across the state with an exclusive nodal agency / Society for I.T. at the state level and dedicated Project teams at each department. These teams would have a judicious mix of people both from with the government and experts and professionals from the private sector. Thus, E-government initiatives are about the capture, management, use, dissemination, and sharing of information.

India – National E- Governance Action Plan		
Statewide Rollout	**Nationwide Rollout**	**Services**
• **Land Records** • **Registration** • **Treasuries** • **Transport** • **Police** • **Municipalities Gram Panchayats Commercial / Sales Tax** • **Agriculture** • **Courts etc.**	• **DGFT** • **Customs Central Excise Postal Department** • **Passports** • **DCA Direct Taxes**	• **E D I** • **Integrated citizen services** • **Payment Gateway e-Biz** • **e-Procurement**

E-governance in India has steadily evolved from computerization of Government departments to initiatives that encapsulate the finer points of governance, such as citizen centricity, service orientation and transparency. [1] To address the requirements of various personnel's involved and to check the efficiency, government must have complete understanding and thorough knowledge of the system along with proper documentation and must possess sufficient manpower that is capable enough to monitor these systems. These projects are highly complex and huge cost is involved in the development and maintenance of such projects. So, if any of these projects fails it is a huge loss for the nation as these projects are specifically funded by various departments and tax payers money is at stake too. Thus there is a need to analyze various factors or elements that may lead to success or failure of such kind of projects.

E-governance can be defined as leveraging the benefits of information and communication technologies to improve effectiveness and efficiency of government activities. [3] Besides the external factors like political issues, management issues, organizational policies, etc, the technological factors also play a major role. The technological support to e-governance projects must ensure that the data and information maintained in the databases must be effective, confidential, available, and reliable and should also maintain the integrity of the same. There are various technological issues that if not taken into account may lead to failure of the project.

II. TECHNOLOGICAL REQUIREMENTS FOR IMPLEMENTATION OF E-GOVERNANCE PROJECTS

Technology infrastructure provides information with respect to applications, databases, infrastructure (IT and physical infrastructure), connectivity, etc. The various components should be chosen carefully for the evaluation. These components should be based upon the technical feasibility, economic feasibility and criticality of requirements.

The following points should be considered while dealing with technology infrastructure:

• Adaptable and rbust applicatin platfrm t meet the varying requirements
• The user interface must be extremely user friendly s as t reduce the impact f change management
• Installatin and implementatin prcedures shuld be kept clear and simple, t the extent pssible
• Scalability shuld be there in the infrastructure s that the future requirements culd be addressed easily.
• Capable f executin acrss different platfrms
• Secure s as t generate cnfidence amng varius stakehlders
• An apprpriate disaster recvery and business cntinuity plan [9]

Lack f technlgies is a majr bttleneck fr cuntries aiming t implement and maintain e-gvernment. Legacy systems may als represent cnsiderable bstacles t change. The demgraphic and gegraphic cnditins f different areas, accmpanied by the distributin f ecnmic activities, may als represent a strng bias in the rllut f ICT infrastructure if left t the market alne. Management systems, recrds and wrk prcesses must be in place t prvide the necessary data t supprt the mve t e-gvernment.

Technlgical Infrastructure	Data and infrmatin systems	Cmmunicatin envirnment
• (Tele) cmmunicatins infrastructure • Penetratin rates f telecmmunicatin • Urban versus rural: demgraphic/ gegraphic bias • Sftware and hardware (legacy systems) • IT standards	• Legacy f data prcessing, management infrmatin and decisin supprt systems • Available and accessible data and infrmatin • Data cllectin prcedures and data and infrmatin standardizatin • Data and infrmatin quality and data security • Capacity t analyze data and utilize infrmatin • Capacity t direct infrmatin flws int decisin-making prcesses • Infrmatin plicy	• Citizen's awareness and understanding f ICT and e-gvernment • Cmmunicatin culture and channels • Infrmatin and knwledge sharing

Table Surce : Plan f Actin E-Gvernment fr Develpment: Gvernment f Italy Ministry fr Innvatin and Technlgies and United Natins Department f Ecnmic and Scial Affairs, May 2003

The different stages f e-gvernment maturity are clsely linked t the successive phases f ICT implementatin at the institutinal level. ver time, individual gvernment agencies are expected t g thrugh similar phases.[8]

III. RISKS INVLVED IN E-GVERNANCE PRJECTS

The main bjective f a sftware applicatin is t make it peratinal at the planned cst and time and mst imprtantly t satisfy all the requirements f the custmer r user. T achieve this bjective the prject team has t wrk n all the dimensins necessary and sufficient t measure the gap that exists between "current reality" and design cncept f the intended applicatin.

Infrmatin managers in gvernment must be aware f the many prblems they face in IT intensive prjects. IT initiatives in general, and e-gvernment prjects in particular, face multiple and cmplex challenges.

The risk invlved in such prjects is mre s risk management shuld be the area f main fcus at the time f develpment als. Risks can be invlved fllwing matters:

- Requirement analysis nt dne prperly- This is the first stage f prject develpment and all ther phases depends n this phase. If there is any ambiguity, cnfusin r mismanagement in understanding the functinal and nn functinal requirements f the prject, then the risk invlved is mre.

- In rder t understand the requirements prperly, the stakehlders must be identified crrectly. These stakehlders may be invlved directly r indirectly with the prject. S gathering infrmatin frm all the stakehlders reduces the risk f failure in determining the requirements f such prjects.

- Prject Planning and Scheduling – The majr risk invlved is the delay verruns due t pr planning and scheduling. The milestnes shuld be set and the realistic deadlines shuld be decided s as t cmplete the prject n time.

Smetimes definite prject plans exist, but they fail t perfrm what they are expected t d. They have vague r unachievable bjectives with lack f rle clarity and expectatins. Thus, effective planning and mnitring are necessary t help achieve the gal.[3]

- Integratin f e-gvernance services amng varius departments – While integrating applicatins designed by different cntractrs, issue f cmpatibility may arise. The technlgy, infrastructure, hardware-sftware platfrms, tls used, etc may nt be cmpatible with ne anther. S this risk can be avided by cnsidering and studying the dcumentatin f already built applicatins and matches them with the mdel f newly built applicatin s that the integratin issue des nt arise afterwards.

- Cmmunicatin gap amng the develpment team r ther stakehlders – Due t cmplex wrkflw and frequently plicy change during sftware develpment phases, a strng interactin is required between bureaucratic expert panel, analysis team, develpment team, testing team and the dmain expert. [3]

- Egvernment can ffer new pprtunities r fraud and crruptin. The data maintained by these applicatins is highly cnfidential s it shuld always be secure. While ging fr risk identificatin and prirtizatin, this aspect must be taken care f prperly.

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- The cmpatibility and cmpliance with management systems, recrds and wrk prcesses in place t prvide the quantity and quality f data t supprt the mve t e-gvernance is als ne f the issue that need t be addresses. The interactin between tw r mre web applicatins requires the data t be cnverted int a standard frmat that shuld be cmpatible in prcessing by bth the applicatins.

- Smetimes there is lack f facility in the frm f cmputing and telecmmunicatins infrastructure n which many e-gvernance initiatives have been based. S, this als is a cnstraint while develpment f such applicatins.

Categries f Risk

- Technlgy Risks
  - o Security and virus treat
  - o Hardware Failure
  - o Sftware Failure
- Specificatin Risk
  - o Gap in requirements
  - o User friendliness
  - o Cnvenience
- Planning Risk
  - o Cst
  - o Time
  - o Change
- rganizatin Risk
  - o Peple participatin
  - o Citizen participatin
  - o rganizatin culture
- Structure risk
  - o Prcess rigidity
  - o Fear f lsing pwer
  - o Mre accuntability

Surce: Mahalik, D. K., An ANP Apprach fr Priritizing Risk in E-gvernance: An Appraisal, JAAG, Vl. 7. N.1, 2012

IV. MEASURES T VERCME RISKS

ICTs can help reinvent gvernment in such a way that existing institutinal arrangements can be restructured and new innvative arrangements can flurish, paving the way fr a transfrmed gvernment. By integrating technlgy int develpment planning, mre effective and speedy slutins can be fund fr ecnmic grwth and sustainable human develpment.

Talking abut the technical issues in scial e-gvernance systems varius factrs f the applicatin such as its user interface, infrmatin display, rganizatinal fit, etc all play a majr rle. The success r failure f the applicatin can be judged by user's reactin t these technical systems, its perfrmance, reliability f infrmatin, easy access and s n.

T avid the abve mentined technlgical risks the prttype r pilt prject shuld be built first and reviewed at an early stage f

develpment. This will help the varius stakehlders including gvernment departments t get a valuable insight and will enable them t understand the feasibility f implementing the initiative. nce the system/applicatin develpment is cmplete, the usage/efficiency f the system can be mnitred by pilting the initiative and rlling them ut in phases. [3]

Secndly the key areas shuld be identified and risk prirtizatin shuld be dne t ensure that they are nt taken by surprise when there is large scale implementatin. If the prject is t large and cmplex then mdular apprach shuld be fllwed where the whle prject is divided int varius sub mdules and then implemented and tested ne by ne. This will als help in better management, tracking and mnitring f such prjects.

Thirdly, as these prjects are large, cmplex and take lt f develpment time and effrt s incrprating changes in between is very tedius task. Therefre, prper guidelines fr managing such changes shuld be set therwise; the prject develpment will becme the never ending prcess. Thus, change management prcess must be fllwed if any changes are t be made in the prject.

Due t emerging trend f increase in usage f these applicatins, ne has t deal with millins f entities and e-gvernance prjects are frequently large. With pressures frm all the stakehlders as well pressure t cpe-up with the private sectr, e-gvernance prjects are frequently ambitius. But, the bigger and blder the prject, the greater is the risk f failure. Designers must recnfigure such prjects t limit the extent f change at any given time. Stretching prject time hrizns is ne technique. There is als a grwing cnsensus behind mdularity where ne business functin is taken at a time and incremental mdel f develpment is being fllwed (prviding stepped levels f supprt fr business functins) within e-gvernance prjects.

Design f such applicatins shuld be dne keeping in mind fr future extensibility as well as legacy system. The applicatins shuld be develped and services shuld be integrated in such a manner that they can be reused in ther similar types f prjects. Standard frmat shuld be fllwed s that end-user training is nt required again and again. It shuld be easy t learn and user friendly design with the scpe f extending it further at a later stage if at all required. Standardized dcumentatin f cmments/ bjectins leads t effective supervisin-thrugh cmparative indicatrs.[6]

These prjects must be able t secure critical infrmatin assets against the lss and theft, ensure data cnfidentiality, integrity, availability and cntinuity f IT services. T maintain the security f infrmatin at such level, all the infrmatin shuld be stred and transmitted in encrypted frm ver the netwrk. Varius security mechanisms shuld be applied such as implementing SSL, usage f firewalls and ther security services.

Sme f the technlgical recmmendatins given in the Eleventh Five-Year Plan (2007-2012) fr Imprving the Efficiency f e-Gvernance Initiatives were:

- Encurage reusability in e-gvernance prjects at bth the infrastructure and applicatin level
- Faster replicatin f already successful e-gvernance prgrams
- Define interperability standards/criteria and ensure that e-gvernance applicatins adpt these standards irrespective f the vendr supplying the technlgy
- Ensure that e-Gvernance applicatins are IPv6 ready

Varius technlgical aspects shuld be taken care f like the type f SDLC mdel t be used fr such prjects (prttyping being the best), identificatin and creatin f database schemas as well as and repsitry f databases being maintained either centrally r distributed, cnnectivity f varius netwrks, infrastructural base, change and cnfiguratin management plicies and s n. The risk is always there while develping such a huge and cmplex applicatin but the recvery mechanism shuld be efficient enugh t handle such unfreseen circumstances as well. T ensure the success f e-gvernance prjects, it is necessary t have smth sharing f infrmatin and seamless interperability f data acrss e-gvernance applicatins. There is a need t design prject plans and mechanisms t enable replicatin f successes and these successes f a prject depends n its planning, rganized apprach twards executin, and mnitring prgress at different stages. The dcumentatin f such prjects must include the infrmatin security risk assessment, mnitring and evaluatin strategies.

V. Cnclusin

The current IT landscape calls fr Gvernment bdies t imprve and develp their IT infrastructure and initiative. The slutins ffered shuld be custm designed based n deep dmain expertise and technlgical capabilities addressing the unique and challenging needs f majr gvernment rganizatins. The majr technlgical risk factrs invlve prject team skills and expertise, data and quality risks, security prblems, technlgical incmpatibility and cmplexity, change management, recvery mechanism and s n. Therefre, risk management shuld be the

majr aspect t be kept in mind while planning fr the develpment f such types f prjects.

Implementatin and use shuld sustain ver lng perids and measurable benefits delivered t all stakehlders-need fr evaluatin. The setting up f prtals and electrnic kisks fr service delivery t the citizens frm different departments shuld be encuraged. Increased cmplexity f the envirnment has made it imperative fr every rganisatin t adpt a systematic apprach t risk, which may help it t manage uncertainty, threats and maximise pprtunities mre effectively.

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