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Department of Administrative Reforms & Public Grievances

Ministry of Personnel, Public Grievances & Pensions
Government of India

NCeG 2018

National Conference
on
e-Governance

Technology for Accelerating Development

CONFERENCE PAPERS

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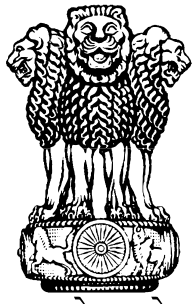

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Technology for Accelerating Development

CONFERENCE PAPERS

21st National Conference on e-Governance

26th & 27th February 2018, Hyderabad (Telangana)

डॉ0 जितेन्द्र सिंह
राज्य मंत्री (स्वतंत्र प्रभार),
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सत्यमेव जयते

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FOREWORD

The core of e-Governance is based on reducing the internal complexities in the functioning of government, expediting procedures through digital means and creating an enabling environment.

In today's technology-enabled world it is imperative to deploy accelerating technologies to ensure rapid development. This is required to meet the expectations of the citizen and society at large.

With this backdrop, on the occasion of 21st National Conference of e-Governance, I am pleased to introduce the 'Conference Papers' with key insights of public and private stakeholders on critical areas of Building User Experience, Emerging Technologies, Universalisation & Replication and Governing e-Governance.

I thank all participants from industry and government who have contributed with full enthusiasm for developing these Conference Papers.

I believe that these Papers will provide a new direction and resurgence in administrative reforms by leveraging the power of digital technology.

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DEPARTMENT OF ADMINISTRATIVE REFORMS
& PUBLIC GRIEVANCES
SARDAR PATEL BHAVAN, SANSAD MARG,
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21st Feb. 2018

MESSAGE

The 21st National Conference of e-Governance is all about leveraging technology for accelerating development. These 'Conference Papers' ably set the context, and provide background and information on a range of areas around the sub-themes.

The Papers study the impact of technology on the governance landscape in India, focusing on Building User Experience, Emerging Technologies, Universalisation and Replication and Governing e-Governance. Factoring in the disruptions in the technology landscape, these Papers attempt to provide a roadmap for managing the difficult but critical transformation in governance ahead of us.

Department of Administrative Reforms and Public Grievances (DARPG) of Government of India would like to express its appreciation to various organizations and institutions for their valuable contributions, without which this compilation would not have been possible.

DARPG would like to thank its industry partner, NASSCOM for curating this publication, especially Shri R. Chandrashekhar, President of NASSCOM, Shri J. Satyanarayana, Advisor to the Government of Andhra Pradesh, and all the authors from Adobe, ESRI India, Wipro, Microsoft, KPMG, TCS, Symantec and HPE, who worked on these 'Conference Papers'.

21/2/18

(K.V. EAPEN)

सत्यमेव जयते
अजय साहनी, आई.ए.एस.
AJAY SAWHNEY, I.A.S.

सचिव
इलेक्ट्रॉनिकी और सूचना प्रौद्योगिकी मंत्रालय
भारत सरकार
Secretary
Ministry of Electronics &
Information Technology (MeitY)
Government of India

Message

The National Conference on eGovernance (NCeG) serves the important role of bringing together public and private stakeholders to discuss and detail the roadmap for technology in governance, a crucial element of the Digital India programme. As the nodal ministry for Digital India, MeitY is privileged to partner with DARPG for hosting this Conference.

I am happy to see that these NCeG Conference Papers compiled by NASSCOM include a wide range of contributions on the Conference sub-themes of Universalisation and Replication, User Experience, Governing e-Governance, and others.

A key part of standardising, universalizing and improving e-governance services for a billion-plus Indians, is a Digital Service Standard (DSS). In the absence of an existing DSS, MeitY has established a committee tasked with developing a DSS, and I am happy to note that this area has been adequately covered in this publication in a Paper co-authored with the Chair of the MeitY Committee on Digital Services Standards, Shri J Satyanarayana.

(Ajay Sawhney)

Dated: 21st February, 2018
Place: New Delhi

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21st National Conference on e-Governance

26th & 27th February 2018, Hyderabad (Telangana)

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Department of Administrative Reforms & Public Grievances
Ministry of Personnel, Public Grievances & Pensions
Government of India

Ministry of Electronics & Information Technology
Government of India

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Key Contributors

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Toward a Consistent Service Experience

The role of a Digital Service Standard in citizen-centric governance

Governance is the art of balancing the diverse needs of citizenry while optimizing the service delivery mechanisms. To ensure an equitable access to services and augment the related user experiences, there is an increasing thrust to build online service delivery mechanisms with 'collaborative' approaches and 'consistent' interfaces.

Establishment of a Digital Service Standard (DSS) would ensure that irrespective of the nature of service, digital services (DS) would provide more holistic end-to-end-digital experiences to the stakeholders. Amongst several other benefits reaped through consistency of interfaces/processes, adoption of DSS would lead to creation of healthy feedback loops and robust measurement processes too. Appreciating the fact that Digital India is mature enough for induction of DSS, the proposed study aims to delineate the definition, vision, lifecycle, implementation strategy and the challenges for establishing Digital Service Standard (DSS) in India.

Citizen Services: The Need for Standards

Citizens require innumerable public services in their day-to-day lives. The main goal of all the public service delivery processes is 'citizen-centricity' so that the objectives of service -responsiveness, value, integration, choice and enhanced citizen-experience are successfully met [1]. For achieving these service objectives, governments strive to realize the e-avatar of services employing Information Technology (IT) aspire to literally place governance in the palms of its beneficiaries. However, what mars the potential benefits of convenience and efficiency of e-services is the lack of standards to be used in 'conceptualizing', designing, 'building' and 'delivering' these services.

Digital India and Standards

The Digital India program was launched in the country in the year 2015 to serve as an umbrella program for all the e-government services operating at its varied levels (center, state, local).

However, this national program did not explicitly advocate adoption of any service standards for providing a homogenous delivery of electronic services (e-services). As a result, different states of the country and different agencies within the same state continue maintaining different approaches launching web-portals, and dashboards for their respective e-services with varied capabilities and efficiencies. This is obviously hard to comprehend for the end-user, who could probably be shifting bases across different states and yet need to avail the same services. These variances in nature and quality of e-services arises out of several factors like the variations in the state legislations, different levels of maturity in use of technology, the adoption of different norms for defining the services and the service levels and the historic way in which such e-services have evolved in different areas. As an instance, delivery of services relating to land records in Maharashtra through 'e-Mojani'[1] is very different from that in Karnataka through 'Bhoomi'[2] . While there are several services that can be delivered everywhere through a common process, say birth and death registrations, each state agency still ends up 're-inventing' the wheel. What is pertinent to be understood is that e- service is a 'product' / an 'artifact' in itself, and therefore, standards has to be evolved for e-services too, to remain comparable to the global benchmarks.

[1] *Mojani* means 'Land Survey' in Marathi
[2] *Bhoomi* means 'Land' in Kannada

(Pic: 123rf © xtockimages)

DSS Worldwide

Australian government and UK government are among the leaders in defining and using Digital Service Standard. In Australia the Digital Service Standards are defined and regulated by its "Digital Transformation Agency, DTA" which is an executive agency within the Prime Minister and Cabinet portfolio and aims "to help government transform services to be simple, clear and fast" [2]. Similarly, UK too has defined a set of 18 criteria as its Digital Service Standard to be used by its departments "to check whether a service is good enough for public use" [3][4]. Irrespective of the contextual disparities, India too needs to take a cue from such international 'best practices' on establishing standards for its own e-services. These standards would help to provide 'consistency' in its design and delivery and also help to 'measure' the performance of e-government services of the country.

Measuring e-Services: e-Taal

e-Taal is an electronic dashboard for providing a real-time aggregated view of various e-services being delivered across different ministries and agencies of the central, state and local governments in India. It treats total number of 'end-to-end electronic transactions' as the indicator for measuring the real-time performance of e-government services. At present, over 3,500 e-services from 21 central ministries, and 36 states/UTs have been registered with e-Taal. The dashboard also facilitates a quick analysis of transaction data of various applications in tabular as well as graphical form enabling users to drill down to the lowest level of detail without impinging on the privacy of the service-seeker or the security and integrity of the application software.

> "India's MeitY has constituted a Working Group to develop a DSS, or Digital Service Standard, with recommendations expected to be submitted to the Ministry within FY 2017-18."

Though e-Taal provides administrators and citizens a means to objectively evaluate performance and identify areas for improvement, it does not measure the quality aspects of the e-services. For instance, assessment of citizens' satisfaction of various service delivery channels might help the implementing agency

to understand which delivery channel is to be prioritized for improvement. However, these qualitative attributes are not captured through e-Taal.

Further, as the national ecosystem becomes increasingly digital in nature, it becomes imminent to evolve a more uniform and rational measurement system. Therefore, it is opportune time to evolve a common understanding, common definitions and common benchmarks, metrics and measures for digital services. These measures should be not just context-agnostic and consistent but trusted and easy to understand / apply by all. Further, evolving a common template of these attributes for measurement and assessment of digital services would avert the duplication of efforts undertaken by multiple agencies to evolve their respective measures.

The Need: Establishing a DSS in India

The time is indeed ripe to redefine national understanding of the term 'digital service' in contrast with 'e-service', identify the various phases of life cycle of DS and then evolve a compendium of Digital Service Standard (DSS) significantly from the citizen-centric perspective. This focus on citizen-centricity itself would require that citizens' inclusiveness is built into the design and delivery of DS.

With over nine out of ten Indians accessing the internet through mobile phones rather than computers, it's imperative that government services be mobile-accessible—a key part of the proposed DSS (Pic: 123rf © tbel)

Aim and Flow of the Study

With the changing technology scenario, there is a convincing need to define what a digital service is and how it should be 'standardized'. The study is a modest attempt in that direction. The study first attempts to define the term 'digital services', then moves on to explain all the phases that constitute its lifecycle. Subsequently, the need for Digital Service Standard and a conceptual framework for the implementation have been presented, followed by expected challenges and some set of recommendations that could help in successful implementation of DS and DSS in the Indian context.

The Emerging Spaces of Digital Services

The rapid change in the technology landscape is leading to a quick obsolescence of the prevailing strategies, architectures, and designs of the e-governance era. Further, the digital mindset of the millennials is expecting the institutionalization of cross-functional collaboration for provision of integrated services, besides creation of 'virtual offices' with flat or no hierarchies. This all compels an emerging need for the Governments to review, rationalize and enhance the existing e-services, besides creating a new breed of 'digital services' with a high 'speed-to-market'.

Defining Digital Services

Digital service, enabled by e-government technology, offers people bundled up services that could emanate from various public agencies together as a single, joined-up service in a virtual one-stop-shop. It is an enterprise-wide, holistic, and inclusive approach to applying emerging technologies in public service delivery mechanisms. The design approach to digital services is completely collaborative and citizen-centric/ stakeholder-centric in nature. The essence of DS is that all public service delivery processes be 'transformed' and be made digital end-to-end to produce an enhanced User Experience (UX). In this strive, it steps up to simplify service delivery mechanisms to the stage of partial or complete elimination with bare minimum existence

of physical movements/ activities or paper trails. The digital services range from routine transactions to services involving complex and integrated backend processes.

Achieving such an integrated approach to public service delivery depends on several imperatives, including:

(i) Use of open standards and protocols for the various technical platforms to ensure back-office integration, so that internal processes are coordinated and run smoothly together.

(ii) Robust interoperability (i.e. each system is compatible and works with other systems).

(iii) An IT infrastructure that supports the use of digital identities and digital signatures.

Such a digital service regime calls for entirely new capabilities both in the service provider community and in the consumer community. For people, it means that interacting with public administration becomes much simpler.

Life Cycle of Digital Service

The life cycle of DS would serve as an indication of various phases (four) that a digital service traverses through as well as a conceptual framework for defining Digital Service Standard. This lifecycle is quite akin to the system development life cycle (SDLC) or e-governance project life cycle (e-GLC). Whenever a demand is echoed by the ultimate stakeholder (or when the government regulations insist) the 'idea' of a digital service germinates and then pre-defined DS lifecycle is initiated for converting these 'voices' into tangible gains.

Irrespective of the type of DS, which could be a simple transaction or a complicated set of processes, DS essentially traverses through four phases viz. Define, Realize Measure and Govern in the DS lifecycle.

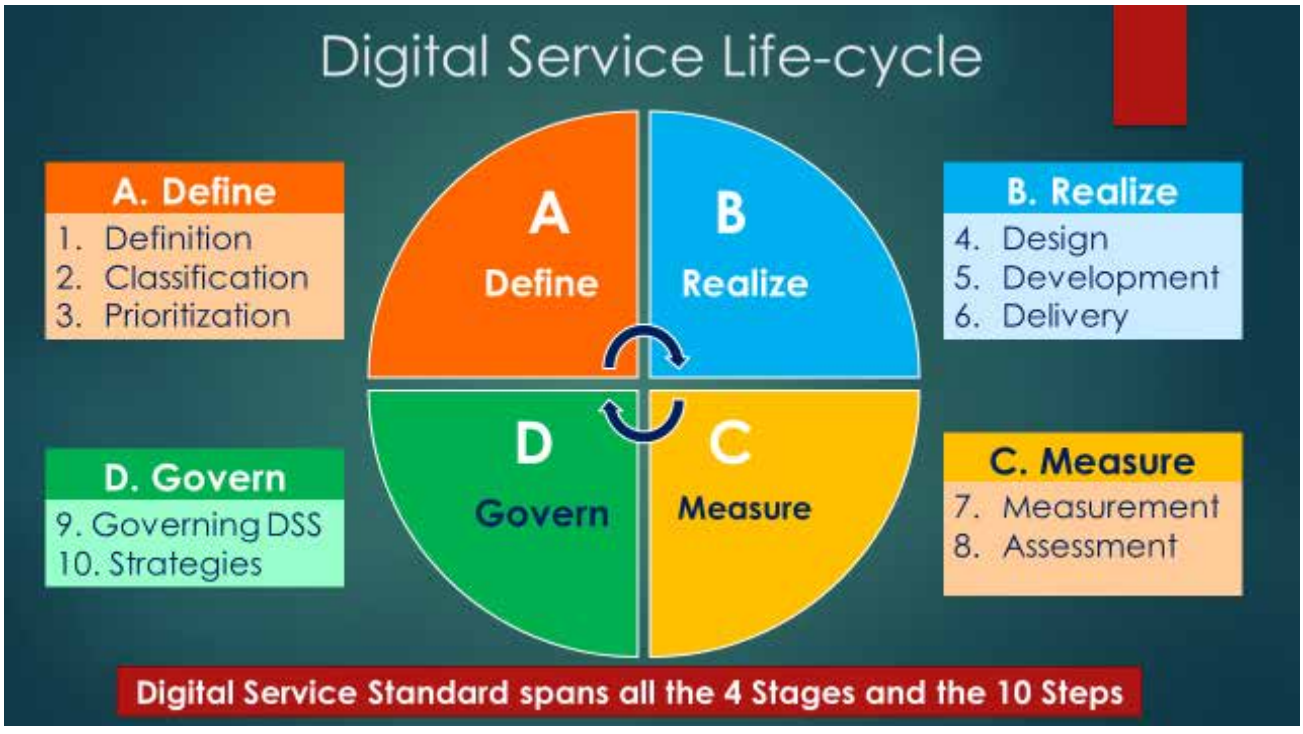
> "The DSS seeks to define a national standard, to ensure uniformity, consistency, comprehensiveness and excellence in the definition, realization and measurement of digital services."

The first phase ('Define') of DS entails three explicit steps – 'Description, 'Classification' and 'Prioritization'. This phase provides a basic insight into the scope of the DS and how it is to be classified-according to the nature of the ultimate beneficiary, as per nature of service or as per the service provider.

The next phase of the DS ('Realize') encompasses 'Design', 'Development' and 'Delivery' steps to ensure that the newly germinated idea converts to a tangible return. The 'Design' step of the second phase is probably one of the most important steps of the lifecycle where all the requirements and specifications described as per users and government are collated. These collated requirements dictate the technology, architecture and standards required to develop the proposed DS. It is at this stage that a detailed elaboration of expected User Experience (UX) and User Interface (UI) are also delineated. In the next step ('Development') the proposed design aspects, including UX and UI are actually implemented through appropriate technology usage. The final step of the second phase is the 'Delivery' in which the channels (web or mobile app etc.) are implemented along with appropriate enablers including the appropriate grievance redress systems.

The third phase of DS is the 'Measure' phase, which includes 'Assessment' of the in-between-steps of the last two phases as well as 'Measurement' of the final output and outcome of the DS. It describes the tools and techniques by which measurement and assessment can be done for these services in terms of the standards defined by DSS. More specifically, in the 'Measurement' stage -'output' as well as the 'outcome' of a DS are measured against pre-defined standards / principles to ensure that the desirable impact of DS is assured.

The fourth and the final phase of the lifecycle is the 'Govern' phase of the lifecycle. Once the Digital service is fully established, it comes to



Digital Service Lifecycle: Government services, especially digital services, traverse through four phases: Define, Realize, Measure and Govern

governing of these digital services that includes the establishment of the necessary institutional frameworks and related strategies to ensure its continuous enhancement and sustainability.

The entire life cycle of DS would ideally be recursive in nature so that digital services evolve to be more responsive to the needs and aspirations of citizens (and the other stakeholders).

A Digital Service Standard — DSS

A variety of new institutional mechanisms, policy instruments and implementation methods have to be put in place if the promise of the digital service regime is to be realized. Among these is the need for setting a set of standards for defining, designing, developing, delivering and measuring the value created by the digital services. In the absence of such a Standard, to be known as the Digital Service Standard or DSS, it is likely that a plethora of un-coordinated efforts would ensue to produce a sub-optimal outcomes. The major goal of DSS is 'universal access, with disintermediation and enhanced user experience'. Adoption of standards in the four phases of DS viz. 'definition', 'realization', 'measurement' and 'governing', would affirm that a citizen needing a service would be able to quickly discover what she needs, how to get it (what the requirements are--documents, support, payments), where to get it (what are the available channels) and how she can access it. DSS would also ensure that the digital-teams create public services as simple, easy to use, cost effective technology based facilities that good by international standards.

With the above in view, the Ministry of Electronics and Information Technology (MeitY), Govt of India, has constituted a Working Group to develop the Digital Service Standard. The Group is about to submit its recommendations to the Ministry in February 2018.

Vision for a DSS

DSS is being developed as a national standard in the space of digital governance, to be adopted by all the ministries, departments and organizations of the Central and State Governments and local bodies in India. It is necessary for such an initiative to create a Vision and evolve the Standard towards fulfillment of that vision. The vision of the Digital Service Standard is captured in the following Vision Statement:

*"The **Vision** of the Digital Service Standard is to define a National Standard, the adoption of which ensures **Uniformity, Consistency, Comprehensiveness and Excellence** in the **Definition, Realization and Measurement** of Digital Services."*

The vision statement of DSS seeks to capture the intent of DSS to establish standards and principles to be followed throughout the life cycle of a digital service, besides emphasizing the most important attributes of a good digital service. Realization of the vision depends, to a large extent, on the preciseness of defining the attributes specifications of a digital service.

DSS is being evolved as a set of complementing and exhaustive standards, principles and guidelines, laid out as per a taxonomy in alignment with the four phased life-cycle of a digital service depicted in Digital Service Standard illustration.

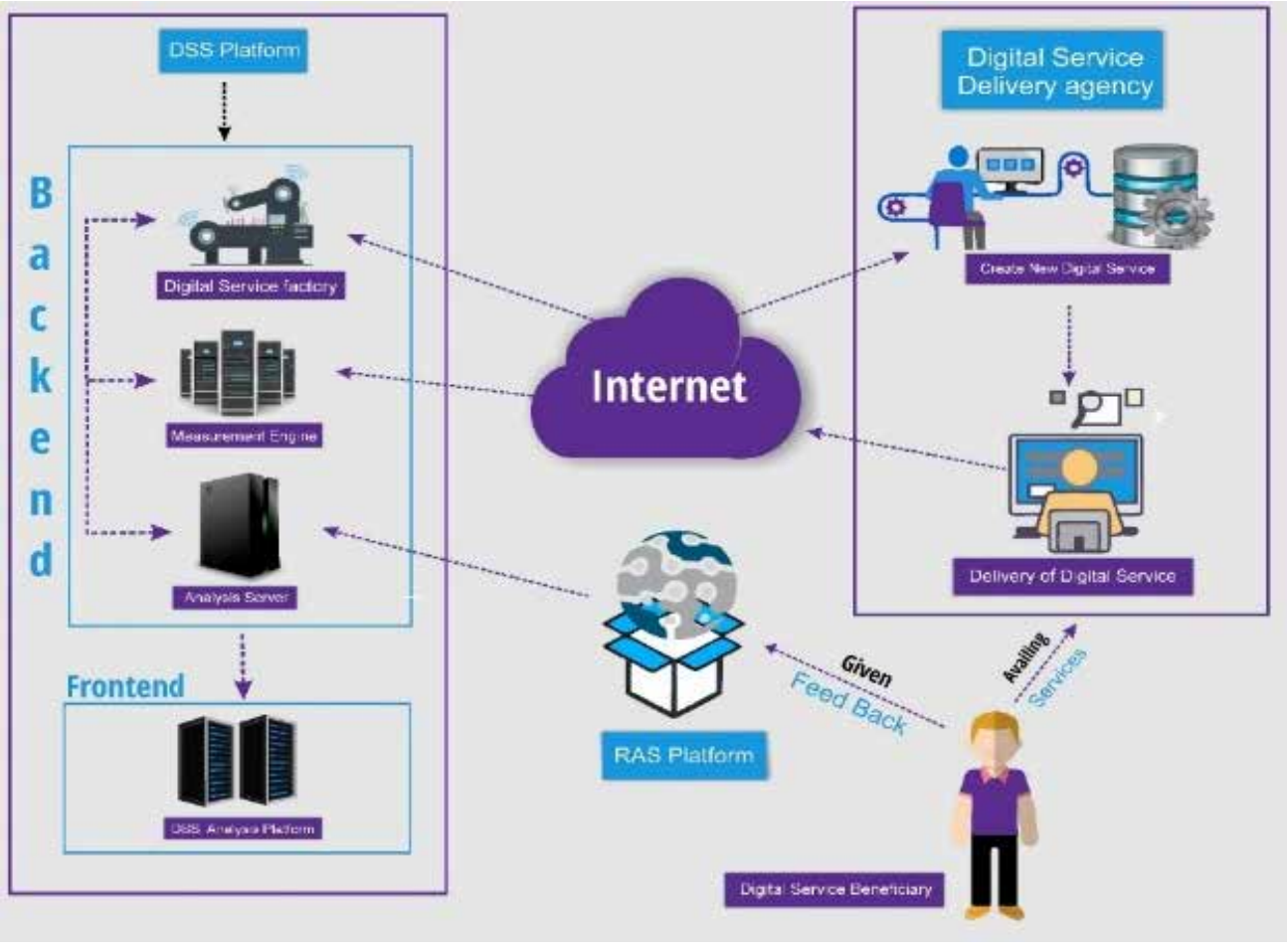
Suggested DSS Implementation Model

The model proposed hereby, with a backend and frontend categorization, is expected to provide a technology-agnostic and pragmatic strategy for implementing DSS.

Backend Platform should have three components:

i. Digital Service Factory: Whenever there would be a request from a service delivery agency to create a new service, this layer of DSS platform would serve as the 'code-factory' to produce new service code for this agency.

ii. Measurement Engine: This layer would help to evaluate the performance of the service delivery processes since it would be fed with all the data-sets of attributes and



The proposed DSS implementation model aims for a technology-agnostic, pragmatic strategy with a back-end and front-end categorization

related algorithms required for measuring the output of a DS.

iii. Analysis Server: this layer would help to analyze the DSS data as well as help to prepare the desired datasets for generating the analytical visuals by the varied front end tools/channels, using the extensive data analytics and deep –learning tools.

Frontend Platform constitutes the pleasing analytical visuals coupled with semi-conversational user interfaces available through multiple channels including the wearable devices. Further, this service delivery platform of 'Digital Service Delivery Agency' may be integrated with Rapid Assessment System (RAS) for feedback by beneficiaries / stakeholders.

Implementation Issues and Recommendations

To prevent the study from becoming too rhetorical, it attempts to present various challenges that could impede successful implementation of DSS, with special reference to Indian context. Every problem has a solution and therefore every anticipated challenge mentioned in the study has been 'countered' by a brief delineation of recommendations to make DSS implementable, maintainable and enforceable in a country like India.

At the outset, one must realize that multiple obstacles that assail successful implementation of conventional e-government services in India may also continue to impede efficacious implementation of digital services and Digital Service Standard (DSS) in the country. For instance, the infrastructure constraints in India mar user -experience in availing e-services, successfully and with full satisfaction. Other concerns like resistance to change and lack of in-house capabilities would also impede the successful uptake of DS and DSS in India. Some of these implementation challenges are presented herewith – each followed by some suggestions to surmount it.

> "As the national ecosystem becomes increasingly digital in nature, it has become crucial to evolve a more uniform and rational measurement system."

Sustaining the Transition of e-Services to Digital Services

a. It would be a herculean task to re-configure and integrate the existing e-services and its related technology with the proposed DS / DSS framework. Therefore, DSS should propose a proper transition plan from existing e-services and erstwhile technology platforms to the newer ones.

b. There will be bigger onus of blending and calibrating of traditional and alternative data sources in the production of official statistics with Big Data techniques. Therefore, national/ state statistical agencies need to be recognized as providers of data and need to be retrained as data analytics officers of national importance.

Need for a Robust Governance Framework

c. India still does not have any data related framework policy or Act to govern digital services effectively. The Electronic Delivery of Services- EDS Act, is still in process. In the absence of any regulatory mechanisms, uptake of DS and DSS would be slow. Therefore, it is necessary to evolve and implement an explicit Digital Services Act, along with a set of supporting policies that would drive DS and DSS adoption in India.

d. Data security and guarantee of maintaining the privacy and confidentiality of personal sensitive data would become more glaring issues than ever before. Regulatory mechanisms for data sharing as well as for promoting data standards need to be established.

e. There is also a need to establish a

Economic growth hinges on mobility of labour. Migrants in the vast unorganized sector struggle with varying rules and services in different cities. A digital service standard can save them time and wages (Pic: 123rf © Beauty Pandit)

dedicated DSS Agency (such as "Digital Transformation Agency" of Australia). Such an agency could take care of constant upgrading of DSS as per the emerging technology trends and could also be responsible for providing the support of multidisciplinary Digital Service Teams to facilitate service delivery agencies in end-to-end implementation of DSS.

Co-Creating the Digital Spaces

f. Since digital services propose to have a citizen-inclusive design approach as well as a healthy feedback loop, efforts have to be stepped up to provide collaborative platforms through all possible channels. These channels should be a balanced mix of Internet-based and non- electronic collaboration channels and mechanisms [5].

g. To be further responsive to digitally illiterate or remote rural users, the usage of Common Service Centres (CSC) has to be strengthened to serve as a facilitating medium between digital service and users.

h. For the similar reasons, even the feature phone users of the country must be provided with simplified mobile versions of the digital services so that they too can benefit from the DS and also communicate their needs, aspirations, and feedback [6].

i. Proactive public sensitization: Government may propose to upgrade its national education policy to start the concepts of digital services, which can start from the secondary level itself. It is desirable to introduce 'Masters in Digital Society' program at the university level. Multi-stakeholder efforts must be made to organize related hackathons to identify early harvest services that could be migrated to DS / DSS. Further, public competitions and awareness campaigns may be organized on the prevailing citizen

> India still does not have any data related framework policy or act to govern digital services effectively, which could slow down uptake of a DSS. An explicit Digital Services Act could drive digital service adoption in India

engagement portals (mygov.in).

j. Capacity building of Government officials and Political Leaders:

   i. The ever-changing trends of digitization would have a direct impact on the design of DS and its related standards. Therefore, there is the need for up-skilling of government officials and political leaders in emerging technologies.

   ii. More specifically, there is a need to develop the national statistical capacity as well as data analysis and management skills of public servants.

k. Newer HR requirements and higher budgets – Maintenance and support for digital services and monitoring of DS as per DSS may increase the human resource budget. Self-sustaining models have to be evolved to meet this critical need.

Conclusion

The time is now promising in India to refurbish our own national understanding of e-services in a manner so that the new paradigm imbues more of citizens' needs and aspirations and is not based on only technology imperatives or the perspectives of service-delivery agencies. Keeping this in view, the primary goal of a DS is to make public service delivery mechanisms more transparent, efficient, and aligned with the sustainable development goals (SDGs).

Digital Services are qualitatively different from the 'e-services' not only in terms of the new-age design notion but also in their goal to create new value at the frontiers, supported by a whole set of new processes. Digital Service Standard (DSS) go a step in this direction. DSS helps to bridge the gap between the existing e-Services and the digital services envisaged by advocating consistency in processes, interfaces, and measurement techniques. DS will provide overall citizen satisfaction and DSS will stretch digital services to perform at par with international standards. Put together as a cohesive unit, DS and DSS aim to and the concept of 'ONE Government' that is citizen-centric, citizen-inclusive, self-correcting and consistent. It would ensure that the digital teams of the country build government services that are simple, easy to use, consistent, cost effective, and meet the relevant global benchmarks.

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21st National Conference on e-Governance

Universalization and Replication

Mapping Governance Success

As a foundational layer for e-governance services, GIS plays a crucial role

Developed by

esri India
THE SCIENCE OF WHERE

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Mapping Governance Success

As a foundational layer for e-governance services, GIS plays a crucial role

Governance relates to safeguarding the legal rights of all citizens. An equally important aspect of it is ensuring equitable delivery of public services and growth benefits to all. Good governance ensures that the government is transparent in its dealings, accountable for its activities and has faster response time.

The Digital India initiative by the government aims at reforming governance system through technology and provide Electronic Delivery of Services (EDS). Digital India will transform India into a knowledge economy and a digitally empowered society.

Geographical Information Systems (GIS) forms an important component of the Digital India project and should be leveraged for decision support systems and digital development. While e-governance is the current paradigm, the future lies in embedding geographic information in governance and service delivery

Moving Towards Geo-Enabled Governance

GIS technology helps users unlock the full potential of data to improve operational and business results. GIS can be useful in conjunction with traditional e-governance infrastructure to enable policy makers and administrators to take more informed decisions with location as an important information parameter.

Decisions like where to deliver services within a geographic framework are based on geo enabled decision support systems. Graduating from e-Gov to g-Gov means embedding geographic dimension into various services being delivered to the citizens. Introducing location as an important parameter in the decision making process will make e-Gov projects more comprehensive and holistic.

Government is taking initiatives to enable the administration to re-design and improve existing processes, connect with citizens and facilitate interactions with the society. The combination of readily available Internet access and spatial information through GIS enables the government authorities to provide a new level of service to both businesses and the public. Thus using GIS technology for citizen services makes it more intuitive and interactive, where every citizen has an access to administration.

Financial inclusion is another example of using geospatial data to provide citizen services. The objective of financial inclusion is to extend financial services to the large hitherto un-served population of the country. As an important step towards achieving the financial inclusion goals of the government, Department of Financial Services (DFS) implemented a GIS based solution that could enable it to identify potential areas more efficiently. GIS has helped DFS to easily locate the financial services like ATM's, bank mitra, bank branches and post offices which are the key touch points for financial inclusion. With data of financial services, demographic and population spread, DFS has been able to identify the list of covered and uncovered areas for them to prioritise the coverage initiatives.

The Role of GIS in Universalization and Replication

GIS technology is becoming an integral part of the information infrastructure in many organizations. The unique integration capabilities of GIS allow disparate data sets to be brought together on a common platform to create a complete operating picture. GIS technology illustrates relationships, connections, and patterns that are not necessarily obvious in any one data set, enabling government to make better decisions based on all relevant factors.

(Pic: 123rf © Anton Balazh)

With these capabilities, all GIS applications can be easily managed and replicated for any department as per their priority and other departments with similar requirement can follow the standard replication of already established GIS solutions without much cost and effort in reinventing the same solution.

> "Geospatial technologies are already playing a pivotal role in the implementation of flagship projects such as Smart Cities, Digital India, DILRMP (land records), Swachh Bharat and Clean Ganga"

In government departments, the usage of GIS is quite wide. National mapping agencies like Survey of India, Department of Space, Forest Survey of India, etc. are the early adopters of GIS in India. However over the years GIS has proliferated into a wide spectrum of application like forestry, roads and highways, water resource management, land information system, security, disaster management, etc.

Smart Cities

The Smart City program is one of the most ambitious and forward looking programs initiated by Government of India. India's smart cities mission provides the opportunity to break away from the past by adopting and developing best practices and replicating them. Smartness is all about integration, collaboration, data driven decision making, standardization and spatial thinking.

GIS works as the glue to bring all these component together.

GIS would be at the core of most of the technology initiatives that would drive the smart city journey

of Indian cities. It will integrate various systems like command & control centre, security, round the clock water availability, urban transportation, traffic management and solid waste management around a GIS based service delivery platform. Smart cities use geographic context to reveal insight, improve decision-making, and deliver positive outcomes. Every city may be different, but they all share common operational challenges. Each relies on real-time intelligence for evidence-based decision-making, more effective collaboration, and public engagement. Cities can therefore replicate the best practices, solutions and information systems with minimum efforts and customization. This replication also brings in standardization and universalization across the cities thereby improving the productivity and efficiency of different departments.

Water

For most of the cities which participated in smart city challenge, 24X7 water has been a key priority. With rapid increase in urban population and continuing expansion of city limits, the challenge of delivering water in Indian cities is growing rapidly. In addition, inadequate coverage, intermittent supplies, low pressure, and poor quality are some of the most prominent challenges plaguing water supply in the cities of India. Many large Indian cities have to source water from long distances ranging from 50 to 200 km due to exhaustion or pollution of nearby sources. This increases the cost of raw water and enhances the possibility of leakage during transmission. Even when water supply is adequate, poor maintenance and inadequate replacement leads to technical losses in the distribution network. Errors in metering, unbilled water consumption and plain theft contribute to commercial losses. All this leads to high levels of non-revenue water. Every decision in a utility – be it for planning, design, operation & maintenance and management has a location or

Geospatial technologies play a pivotal role in mammoth projects such as Clean Ganga, Smart Cities and Digital India (Pic: Ganga at Varanasi, via 123rf © kaetana)

Many cities source water from far away: leakage, metering errors, theft all add up to losses and 'non-revenue water'. GIS is at the core of a system for managing round-the-clock water for cities (Pic: 123rf © Umesh Negi)

spatial information associated with it. To realize their vision of 24X7 water supply GIS becomes the core integrating and indispensable component in the overall utilities ICT ecosystem.

Solid Waste Management

GIS technology has been successfully used for siting of recycling drop-off centres, optimizing waste management, estimating of solid waste generation using local demographic and socioeconomic data and waste generation forecasting at the local level. Using on board GPS, the authorities can track in real time the location of garbage trucks, plan and replan logistics thereby optimizing the utilization of pick up vehicles. GIS is also used to plan the location of intelligent bins keeping in mind demographic profile of the location and garbage generation pattern.

Safe and Secure Cities

GIS also comes in handy while dealing with emergency situations, while preparing for and mitigating emergencies. GIS has been a catalyst for several innovations in crime control and prevention.

The traditional process of crime data mapping was earlier limited to charting the location and time of a crime. With GIS technology, law enforcement can now plot crime, both in terms of time and place. This allows investigators to better analyse the data and determine patterns of criminal behaviour within the city.

Transportation

Throughout the transportation infrastructure life cycle, GIS technology helps you create a seamless integration between different modes of transport being used by citizens to commute

within the city. One of the goals of multimodal passenger transport is to reduce traffic on the roads and increase use of public transport. GIS plays an important role here as it helps in storing, analyzing and visualizing spatial data which can serve transportation modelling. In multimodal transportation network, GIS is also capable of dealing with a large amount of data efficiently that accommodates a variety of information about streets, bus, rail (metro), walking routes and their interconnections.

With GIS, information from your planning process can be brought into the design process and easily carried over into other areas such as as-built drawings, operations, and maintenance. Gains in both employee productivity and transportation system performance are made possible by the unique ability of GIS to integrate with a wide variety of technologies.

Citizen Engagement

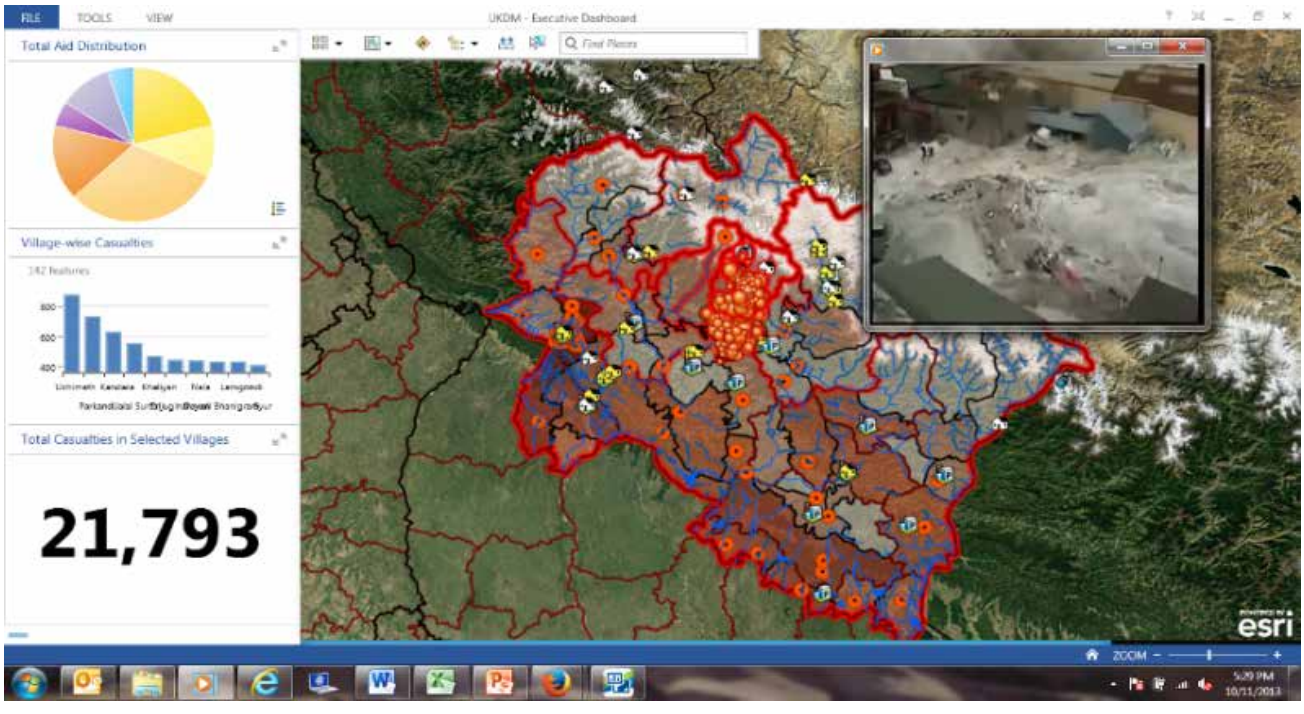
Governments are increasingly developing online GIS-based applications to engage with citizens. These applications are helping the public easily connect with government and in turn helping government, better understand the citizenry it serves. Web and mobile apps allow government organizations to receive immediate feedback from citizens including reports of incidents, suggestions, and general comments. Geography connects citizens and the people who serve in government, and GIS naturally facilitates communication about place-based issues. Citizen engagement makes the government more responsive besides increasing accountability and transparency. Several Indian cities are using GIS for property taxation, water distribution, traffic management, citizen centric services, etc.

Best practices, workflows and information systems developed under Smart City Mission can be extended to other cities besides the 99 cities participating in the mission.

Land Management

In India, traditionally land surveys were carried out with manual techniques and most of the records are very old and inaccurate, as they do not capture the present ground realities. Accurate and up-to-date land records are imperative for economic social equity and development.

They form the basis of land information system



GIS can play an enabling role in simulation of the impact of disasters like floods, cyclones and hurricanes and determine the communities at risk if such an eventuality occurs

that recognizes owner's title, boundaries, taxation, government development plans, etc. This would require computerization of all land records and business processes including mutations, map digitization and integration of non-spatial and spatial data, survey / re-survey and updating of all survey and settlement records including creation of original cadastral records using GIS. Thus GIS serves as a common service delivery platform which plays a major role in implementing land reforms and making the land management more transparent and universalized.

GIS for Sustainable Agriculture

Sustainable growth in agriculture production is essential not only to feed the growing population but also for economic uplift of the farmers. There is a finite limit to increase in cultivable land. Hence solution lies in increasing yield per hectare using modern technology, among others. GIS provides the means to spatially view variables that affect crop yields, erosion and drought risk, and business opportunities. This assists farmers, administrators and agriculture scientists in making informed decisions that help increase production and reduce costs using responsible, sustainable practices. Geographic information system (GIS) enables community planners, economists, agronomists, and farmers to research and devise practices that will enable the sustainability of food production. GIS is also used for crop acreage estimation, enabling farmers and administration to plan storage, transportation and pricing much before the crop is harvested.

> "GIS needs to be dovetailed into decisions support mechanisms for the Digital India mission... GIS can enable g-Gov, the matured version of e-Gov, with an embedded geographical dimension, delivering quality citizen centric services."

Water Resource Conservation & Management

GIS is an effective tool for storing, managing, displaying and analyzing spatial data often encountered in water resources management. It is a powerful tool for management of water bodies, such as river basins, with large amounts of spatially distributed data. GIS technology is used both for visualization and analytics. GIS users from different fields could easily share information and compare spatially referenced data, overlay different GIS layers and obtain new information. With available tools for surface and ground water, spatial analysis can be done to get deeper insights. Datasets can be shared to Govt. of India's "India WRIS portal" through standard services and web based application for monitoring and reporting activities.

Disaster management

Natural disasters are spatial events. They are caused by geographical parameters and happenings on the planet earth; Earthquakes are caused due to disturbance in the movement of plates, which again can be caused due to various reasons like under crust waves or cracks in the tectonic plates. The impact of floods depends on the terrain of the affected areas, soil characteristics and the vegetation cover, among others.

GIS plays an important role in all stages of disaster management; from prediction and planning to mitigation and relief. Even in man-made disasters GIS plays a critical role in the relief and recovery operation.

GIS can be used to collect, create and build inventory of spatial data. GIS can also facilitate integration of spatial data with non-spatial data bases to get a more integrated view. It can also be used to assess the risk of a natural disaster and its impact on human life and property. GIS can play an enabling role in simulation of the impact of disasters like floods, cyclones and hurricanes and determine the communities at risk if such an eventuality occurs. In the event of spillage of hazardous material, GIS is used to model the

track, the plume based on wind direction and other parameters.

Policy makers can determine which geographical locations are prone to disasters like earthquakes, landslides, flooding and take appropriate measures to minimize the impact of a disaster if it occurs. It can be used to identify sites for building temporary shelters for the affected people. It can also facilitate in building logistics plans for movement of relief operation as well as identification of hospitals and other facilities in the neighborhood.

GIS is a very effective tool to build an information dissemination platform to provide common operating picture to all stakeholders with the most current information visually.

Roadmap: To replicate the success across states & cities

Over the past several years, various departments have successfully adopted GIS and implemented projects thereby leveraging its immense potential. GIS forms the core of several mission critical projects in the government and private sector. These include R-APDRP, National Hydrology Project, NLRMP, National Urban Information System, among others. However, the usage has been in silos and success stories have not been replicated across all cities and states. Now is the opportunity to consolidate the work already done and build a comprehensive Enterprise GIS platform at state and city level that will enable g-Gov and bring wide ranging benefits. The platform will be a system of systems which will consist of:

- System of records which will host various geospatial information products including base maps, thematic layers, attribute data, imageries, etc.
- System of engagement which will facilitate access to the data and distributed geo-processing.
- System of insight comprising applications and other tools to enable users to consume the data by way of services and integrate spatial data with non-spatial data created by the user departments.

> "GIS enables community planners, economists, agronomists, and farmers to research and devise practices to enable the sustainability of food production"

The Enterprise GIS platform will be a federated system, which will provide full autonomy to user departments to create, own, manage and update from their own locations subject to their standards and guidelines of the platform.

In Rajasthan, an integrated GIS system has been implemented to provide a robust information and decision support system for planning and implementing various state development programs for empowering citizens, thus ensuring seamless interoperability and cooperation between various departments.

Enabling Geospatial Policy

An enabling geospatial policy will facilitate availability of authoritative, accurate, and standards based geospatial information products to all the users; ensure that data is kept current and is available both in human and machine-readable form. The policy will protect the intellectual property rights of data producers while encouraging creation of value added products thereby enriching it further and extending its usage to a wide segment of users – government, private sector, academia, NGOs and citizens. It will enrich the entire geospatial ecosystem and result in development of innovative applications leading to enhanced usage and adoption of geospatial technologies. Also, data created by national mapping agencies with public funds must be made available to all who can make use of it. There is also a strong need to bring the data on a standard platform and keep it up-to-date.

The policy should encourage private sector to participate in data acquisition, production and dissemination activities in order to meet the users' need of a variety of data sets for their

projects. The policy should support various modes for data distribution including Cloud, Web and magnetic media.

Mechanism must be developed to build collaboration between various stakeholders leading to sharing of content, best practices, workflows and information systems thereby replicating the work already done and avoiding duplication.

Capacity Building

One of the factors restricting wide spread adoption of geospatial technologies has been acute shortage of qualified technical manpower capable of conceptualizing, designing, developing and implementing enterprise systems leveraging full power of contemporary geospatial technology. A related issue has been lack of appreciation of geospatial technologies among the user organizations, both in the government and private sector. A concerted effort is required to enhance awareness of geospatial technologies among potential users. There is also a need to enhance the quality of geospatial education and align it to the needs of user organizations.

Conclusion

In a vast country like India, with significant demographic diversity, GIS promises immense opportunity. The largest consumer of GIS applications is the Indian government. Various state governments have numerous e-governance initiatives, which could use a helping hand from GIS. The unmatched benefits provided by GIS applications in planning, research, development, and deployment are changing the way policy makers make decisions.

Overall, GIS has the power to transform cities, and through them, the lives of ordinary people. It can help build smarter, connected and new age cities that are more sustainable and citizen-centric. Geospatial technologies are already playing a pivotal role in successful implementation of flagship projects of the government like Smart Cities, Digital India, DILRMP, Swachh Bharat, Clean Ganga, among others. It is providing a new paradigm in decision making by enabling geographical visualization and representation of information and thus helping the bureaucrats in taking more informed decisions leading to:

- Strengthening of governance
- Enhanced transparency
- Improvement in citizen services

An enabling geospatial content policy will act as a catalyst in embedding geographic information into various government processes and building powerful decision support systems – the foundation for achievement of the goals of the Digital India Program.

Governing e-Governance

Outcome-Based Measurement

A self-assessment framework for evaluation and measurement of e-governance projects, for gaining a larger digital dividend

Developed by

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Outcome-Based Measurement

A self-assessment framework for evaluation and measurement of e-governance projects, for gaining a larger digital dividend

India's Digital Transformation

Digital transformation is one of the key initiatives of the Indian government in its attempt to leverage technology for overall improvement in governance and for improved citizen satisfaction, across sectors.

It is also one of the key levers to bring in improved efficiencies in various facets of the government. The government has operationalized a number of Integrated Mission Mode projects such as e-procurement, e-courts and e-biz to facilitate efficient operations on an online platform for the citizens.

More recently, initiatives like Direct Cash Transfer, Aadhar Enabled Payment System, Digital India program, MyGov citizen portal, e-Kranti scheme, Digital Cloud and m-Governance have been launched to ease public service delivery. These initiatives have ensured transparency and accountability, along with empowering the people with timely information on important policy considerations.

E-Governance Initiatives and Impact Assessment:

The e-governance systems in place have helped to increase the speed of communication, reduce the cost of stationery, increase convenience to citizens, improve customer service and create an environment of transparency and accountability through the provision of access to information.

However, many e-governance implementations have not been able to provide the necessary "digital dividend" to the masses due to various reasons. These include among others the high costs involved in setting up e-governance solutions, trust of the users, security issues, digital divide and resistance to change.

Therefore, in the new era of "digital governance" there is an increasing need for defining and measuring the outcomes of large digital governance projects for achieving its full potential and increase the "digital dividend" in India.

Much of the benefit from e-governance or digital governance is not measured in terms of productivity or contribution to GDP etc. For instance the increase in time saved and in quality and thus the productivity of work from using the internet can indirectly increase GDP statistics. But there is no framework or method devised to collect the data, measure and have a correlation with the various outcomes. As such, there is an increasing demand for outcome-based measures for a larger digital dividend assessment. This paper discusses a part of such a measurement.

Concept of Digital Dividend and Outcome Transformation

The World Bank's "World Development Report 2016" has extensively spoken about digital dividend. The report has tried to arrive at a direct correlation between internet, digital technologies and economies of the world and has spoken about use of digital technologies for countries to diverge; with classical examples of industries like banking, retail, financial & transport industries, driving and achieving larger outcomes through digital technology implementations. While all these industries directly touch citizens' life on a day to day basis, the government's digital

> "Measurement of actual outcomes of digital public service delivery is essential to quantify the benefits of government's digital investments."

(Pic: Pexels)

initiatives have not been able to do the same with similar impact.

Why an 'Outcome Transformation' Measurement?

The country can only derive the digital dividend of faster growth, more jobs and better services by expanding affordable Internet access to all, providing digital platforms for growth and enabling all government services digitally. While every effort is in that direction, it is also required to create a framework to measure the same.

The focus of the e-governance should lead to administrative reforms and in turn has to ease the life of a common citizen. In the last decade several significant initiatives have been launched to improve the quality of governance[2]. A series of political reforms have been enacted by the Parliament by unanimous consent. Old laws and rules are being reviewed and wherever need be are modified.

An e-government delivery model primarily consists of citizens/businesses communicating with all levels of the government (central, state, district, city, gram panchayat etc.) where involvement in governance is facilitated by using information and communication technologies, such as websites, computers and mobile phones.

> "E-gov benefits are rarely measured in terms of productivity or GDP contribution, even though they can impact both. There is thus an increasing need for outcome-based measures for a larger digital dividend assessment."

[1] Reforms in Governance and Administration, 2nd Administrative Reform Commission – 2005, http://arc.gov.in/reforms.htm, accessed on 08-02-2018

Citing the importance of e-government development globally, the United Nations Department of Economic and Social Affairs (UNDESA) has been publishing the United Nations e-government Survey (since 2001 with 9 editions so far) which provides an assessment of progress made by countries worldwide {through an E-Government Development Index (EGDI)} on usage of e-government, in realization of the internationally agreed sustainable development goals and to help address emerging public administration issues.

In view of the above, to begin with, it becomes essential to evaluate and measure the effectiveness of delivery of basic services to citizens and its larger outcomes in focus sectors of the economy which are considered to be most representative of services that the citizens will use in majority of the cases. The sectors are finance, education, health, labor & employment, social welfare and environment. However, keeping in view of business users and state-level specific

> "E-gov services must be measured on a range of parameters — including mobile accessibility (95% of internet access in India is mobile), and information security and privacy."

services profile of India, new sectors may also be considered.

Assessment Areas and Framework for Outcome Transformation Measurement

Taking a cue from the UN e-governance development study methodology and our experience, the central ministries, states and UTs; we would define the assessment areas as below for the outcome measurement:

Outcome Transformation Measurement (OTM) is considered here as a composite index that will assess e-government development at a state/UT

(Pic: 123rf © Jagdish Agarwal)

level and is a weighted average of 3 normalized indices. We are providing two fifth weightage to Government Transformation Index (GTI), two fifth to Business Transformation Index (BTI) and one fifth to Citizen Transformation Index (CTI).

The indices will be calculated based on data collected from an independent survey questionnaire which will assess the online presence of all 36 states and union territories. GTI and BTI will be normalized scores that will primarily assess the online presence of select services provided by the central and state ministries or departments whereas CTI will be normalized scores of the level of usage of these indices by users. The service delivery websites under each of the focus sectors shall be assessed based on the following key areas:

- **Emerging presence:** When basic or static information is available on the government website portal including linkage to national or state service portal. This may include contact information, section on "about us", news and updates, reports and publications etc. At this stage, a formal but limited web presence is established.
- **Enhanced presence:** Use of more dynamic information on government websites where sites will be linked to other government official websites. Availability of search options, download forms and applications, information guides to avail services, raise requests etc. will be evaluated to determine enhanced presence levels.
- **Transactional presence:** When users can pay for services or other transactions online. This phase evaluates capacity of website service portals to provide a complete and secure transaction online such as obtaining licenses/permits, passports, pay utility bills, registration fees, parking rule violation fines, taxes etc. Usage of digital signatures to facilitate transactions and secure user passwords is also assessed.
- **Connected presence**: Ability to access any service from a single portal where services will be categorised based on citizen/business user specific needs. Full integration of e-services across ministerial, departmental and other administrative boundaries. Availability of interaction channels at G2C, C2G levels where citizens are involved in decision making. Enabling citizen empowerment by publishing information regarding reforms undertaken based on their suggestions.
- **Focus sectors serviceability**: Presence of services in focus sectors of education, health, finance, social welfare, labour/ employment and environment.
- **Single point of service**: Usage of a single portal to avail services at national level, state-level (e-district) or others (Local Self-Government, municipal level).

In addition, the study will assess in-depth the following key areas which are gaining prominence in the Indian context:

- **Mobile e-Serviceability:** Assess compatibility of websites for mobile usage and authentication/security features available.
- **Information security and privacy**: Online website security features available such as third party audits, data privacy policy, user authentication etc.
- **User experience**: Information availability and ease of use of portal to avail the intended service in simple, quick and efficient manner. Usability of services on a range of personal devices (mobile, tab, iPhone etc.) and on different browsers.
- **Content accuracy**: Availability of updated and relevant information. Content availability in different languages, user friendliness of website content in terms of consistent structure/font/colour etc. Options to share content through emails, social media etc.
- **Integrated service delivery**: Unique id (Aadhaar) sign in to avail all services of government portals. Presence of common services at a state portal (e-district) or

(Pic: 123rf © Pius Lee)

national portal. Integration of services across related departments. Availability of online support or help desk for single point portals at state or central level.

- **Social media connect**: Integration of portal of key department official with Twitter, Facebook etc. Citizen empowerment through social media interactions where e-consultation platform for C2G, G2C, G2B is established and decisions are taken basis citizen/business inputs.

The key evaluation areas that will be assessed for business specific e-services are:

- **Setting up a business**: Availability and accessibility of online information for entrepreneurs and investors on regulatory requirements and industry specific licensing, tax filing and payment, single point of contact and common application form to cater to all business needs to speed up the process of setting up a business with minimal visits to government centres.
- **Allotment of land and obtaining construction permits**: Measures the ease of searching and acquiring lands for business purposes. Presence of a comprehensive online list of land resources available for industrial use with features to search for lands based on type of industry, quality of land and usage pattern. Availability of information regarding land allotment, registration, construction criteria, acquirement and building permit procedures.

> “For business-specific e-services we need to evaluate a range of parameters, including compliance with environment procedures and environmental and pollution control permissions for specific locations”

- **Complying with environment procedures:** Online Information availability on policies to comply with environmental procedures such as inspection regimes for each type of industry, specific environmental permissions, online consent management system and fee calculator for environmental mechanisms and also for use by pollution control board to issue approvals and inspectors.
- **Complying with labour regulations:** Availability of online information on labour policy for different types of industries, risk and compliance, specific labour regulations, wages and salaries as per different labour and factory acts, common application form for obtaining labour permissions to reduce physical touch points for new entrepreneurs.
- **Obtaining infrastructure related utilities:** Online serviceability of utilities required for running a business to plan investments and information availability of specific utility NOCS for construction, sewage, fire, water and air permits.
- **Registering and complying with tax procedure:** Online application for VAT and other tax registration, e-filing and payment of taxes, specific registrations and online interface to generate waybills, transit forms and other check posts to ensure risk based approach to tax compliance and expedite process of starting a business.
- **Carrying out inspections:** Online information availability to resolve undue compliance on business inspections, process of carrying out and notifying an upcoming inspection by under specific categories.

The Outcome Transformation Index would be measured as below:

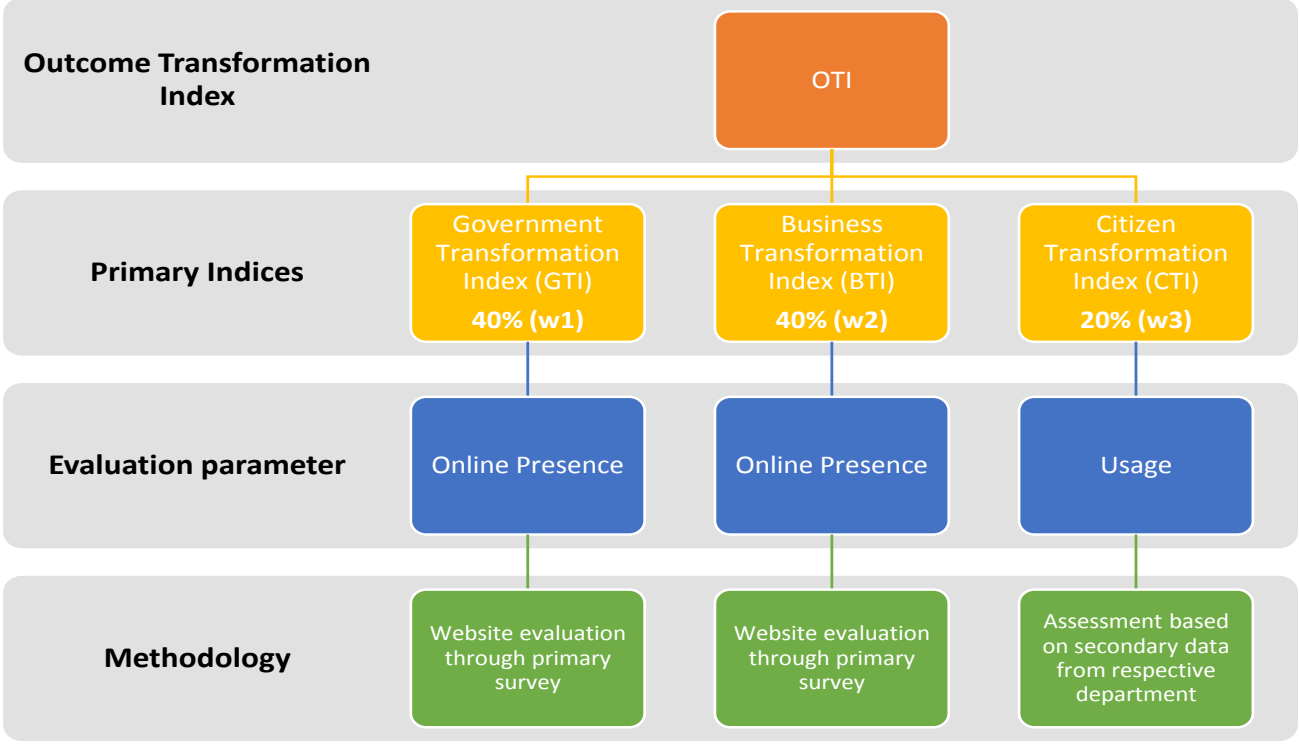
$$\mathbf{OTI} = \frac{\mathbf{w1^* GTI + w2^* BTI + w3 * CTI}}{\mathbf{w1 + w2 + w3}}$$

GTI = Government Transformation Index (normalized score of Online Presence)

BTI = Business Transformation Index (normalized score of Online Presence)

CTI = Citizen Transformation Index (normalized score of Usage)

w1 = 2/5, w2 = 2/5, w3 = 1/5



in a similar fashion by computing progress of select ministries falling under finance, education, health, labor and employment, social welfare and environment, with respect to various phases of e-government development. The website evaluation survey will be undertaken for basic services provided by these ministries and departments in order to derive best practices and learnings.

GTI will be calculated based on assessment of all selected public e-service portals and BTI will be only for those e-service portals which offer services for businesses. Based on the respective index scores OTI can be computed for States/ UTs. This assessment will help central ministries, states and UTs to get a fair idea of where they stand in the overall realm of outcome based e-governance ecosystem of India.

Key Goals to Achieve Through Framework for Outcome Measurement

The framework is expected to achieve the below mentioned goals, in a timely and phased manner.

- Promote participation of various departments and ministries at state and central level to adopt the e-government framework in their day-to-day functioning.
- Encourage e-participation of citizens and businesses in policy making.
- Help achieve India's commitment to the United Nation's Sustainable Development Goals (SDGs).
- Provide efficient public service delivery to all strata of population in the country thus reducing the digital divide.
- On-board states and union territories in the ongoing initiative of UN e-government survey which measures the readiness and capacity of national administrations to use ICT to deliver public services.
- Drive innovation and capacity creation to improve public service delivery across the nation.
- Develop a simple single entry point for all e-services in the country at central, state/UT, district, panchayat, Local Self Government (LSG) level.

Outcome Driven e-Governance – A roadmap to Digital Dividends

In the path towards building a digital economy although India faces challenges with respect to the basic foundations of a digital economy, its key digital reform initiatives like Aadhaar have been reclaimed as global benchmarks. In order to generate greater shared digital dividends leading to faster growth, more jobs, and better services, it is essential to measure the actual outcomes of digital public service delivery to further quantify the benefits of Government's digital investments.

Digital e-governance has been an integral part of government's agenda to build transparency and empowering its citizens through various service offerings. Lately, the use of information and communications technology has been infused into all development initiatives across the globe as it has a great potential to accelerate economic growth of a country.

> "Many e-gov implementations don't translate to big digital dividends—due to user trust issues, security issues, access and the digital divide, and resistance to change."

However, to achieve a successful e-governance system it is necessary to introduce digital interactions between a citizen and government, between government and businesses, between government and its employees etc. in order to function in a seamless manner. Building trust of users and creating awareness about the key value propositions are also essential in increasing participation. What is more important to ensure sustained use of e-governance systems is the manner in which services are delivered —simplified procedures, clear guidelines,

reducing dependence on intermediaries, security standards, etc.

The government, in its pursuit to achieve excellence in e-governance for the benefit of citizens, has embarked upon this journey to facilitate digitization and transformation in direct service delivery and citizen engagement. However, if digital transformation were to be desired or to achieve equitable digital dividends for all or to achieve the aspirational state towards which the nation intends to progress, it is important and more of a pre-requisite that we first have an understanding of the key outcomes achieved so far.

Governing e-Governance

The View from Above

Dashboards and reports give ministers and officials visibility into e-gov programs' functioning and KPIs and zoom in to details, to help them take better decisions

Developed by

TATA CONSULTANCY SERVICES

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TCS

The View from Above

Dashboards and reports give ministers and officials visibility into e-gov programs' functioning and KPIs and zoom in to details, to help them take better decisions

Digital Public Service Delivery

Digital technologies open up tremendous opportunities to provide basic government services like applying for public documents, payment of utility bills, issuing of birth/death certificates, etc. to a much broader population segment at optimal quality, time, place and cost. Digital services also enable rapid scalability and outreach which the traditional public service delivery models cannot achieve.

Successful implementation of Digital by Default service approach requires a multi-faceted and integrated approach, encompassing the following principles:

- **Citizen Centric:** Digital public services focus on addressing citizen needs, instead of being transactional and compliance centric. This is critical to delivering a superior user experience.
- **Effective Incentivization:** Effective incentives could include cost benefits such as reduced transactional fees for digital channels, availability of multiple choices for making payments, extended submission deadlines, better usability with pre-populated forms etc.
- **Building Awareness:** Sustained citizen awareness campaigns that emphasize the benefits of using a digital channel can boost adoption. Benefits highlighted through these campaigns could include improved cost efficiencies, enhanced security, faster approvals, easier payment, and instant access to online support.
- **Platform Agnostic:** Digital services should be available across multiple technology platforms. These platforms should be flexible and should support agile development models to enable rapid and frequent iterations during service design and implementation.
- **Data Privacy & Confidentiality:** Ensuring citizen privacy, data security, and confidentiality can be a challenge when providing digital services. It becomes much harder to protect a citizen's personal information and identity.
- **Cyber Security:** Identity assurance based on standards and technology neutrality will create a simple, trusted, and secure environment for citizens to access digital public services.
- **Ensuring Change Management:** Proactive and early engagement with staff and unions across government departments can help overcome resistance to change
- **Seamless Interoperability:** 100 percent interoperability at zero cost should be ensured through standards based interfaces to exchange and share data and information with each other.
- **Anytime, Anywhere, Accurate Access:** To ensure ubiquitous public service access by citizens, 'anywhere, anytime, anyhow' philosophy should underpin digital service implementation. Information, data, and services must be correct, complete, and securely available to parties with appropriate access rights.
- **Easy Availability:** Systems must be based on open or approved standards to avoid being locked into proprietary technologies. Citizens should not be restricted in their choice to use specific devices or technologies to access public services.

As technology is shaping our society producing digital natives the government needs to bring about a paradigm shift in its approach to public service delivery

Government schemes aimed at social welfare and social inclusion usually entail disbursement of benefits and subsidies to its citizens. These applications are transactional in nature for areas like employment guarantee, pensions, unemployment insurance, rural development schemes, food security etc. Disbursements and subsidy payments may be automated and offered online to increase transparency and control of authorities and also increase the efficiency of the schemes to help the citizens and beneficiaries. While several such government schemes and programs are rolled out every financial year to address citizen needs or for the benefits of the beneficiaries, there is an immediate need for monitoring and governance.

Governance through Digital

Governments are continuously embracing and evolving with newer technologies like analytics and big data to derive actionable data that is essential for their monitoring and governance. Dashboards promise a smooth, data driven decision making environment: cutting costs, providing new insight into citizens' needs and concerns, and allowing for smarter policy and operational decision making.

It is imperative to understand the use and context to these tools. Dashboards present a broad, generalized approach to collecting, analyzing and acting on large data sets. They might still not be the best way of understanding all categories of problems, or research questions. They must be

> "From the CORE dashboard, AP's CM can access KPIs of 33 departments, and drill down into revenue, power generated daily, rainfall, even the number of streetlights switched on"

carefully designed to match real organizational needs. Secondly, the skills required to create and manage dashboards are extremely valuable and sought after by both private and public sectors. Specialized analysts will be required who can combine a new combination of skill sets; ranging from data analytics, design, social science, and public policy to be able to build and project an effective dashboard.

These tools are quite interactive, allowing the user to deep dive, query, edit, rearrange and generally explore and analyze data. When not used for manipulating data directly, dashboards generally serve as monitoring tools, allowing users to get a quick overview of a situation.

The big data revolution is being felt in public sector as well. With dramatic increase in the volume and nature of data being produced, there are even greater possibilities to understand trends, spot patterns, and collect intelligence that is relevant and accurate.

A well thought out implementation is vital if the benefits of using dashboard are to be realized truly.

For example, the CORE Dashboard, of Government of Andhra Pradesh is perhaps the most comprehensive e-governance initiative seen in India that is spearheaded by the chief minister's office directly. For a country where data quality can be unreliable, Andhra Pradesh's push to collect information and share it in a transparent, real time manner is commendable. From the CORE Dashboard, the chief minister can access KPIs from more than 33 departments and other parameters, including the number of streetlights switched on, power generated daily, water levels, rainfall, tax revenue, forest plantation rates, and government revenue. The state has also leveraged Aadhaar to track payments for its welfare schemes in order to reduce and eventually eliminate leakages.

Passport Seva Program is one of the Indian government's largest Mission Mode Projects under the National e-Governance Plan

> "The flagship Passport Seva program helped speed up passport issuance time from 60 days to 7 days: live dashboards report on pendency, productivity, demand and other elements in real time"

Within the social sector, welfare schemes are closely tracked on the dashboard. For example, with almost 97% Aadhaar penetration, district-level MGNREGA (Mahatma Gandhi National Rural Employment Guarantee Act) payments are being made to bank accounts directly, while being monitored online to prevent leakages and theft.

This shows how urban governance in India is being redefined by use of data. Increasingly other state governments are either replicating or following suit, thereby depicting the openness to adopt a data-driven approach to governance.

Both dashboards aligned with big data and analytics bring about increased emphasis on metrics, indicators and measures. They encourage more intensified forms of monitoring and analysis. These technologies speak to a new future, making public leaders agile and responsive.

Success Stories

Delivering end-to-end holistic and integrated solutions comprises of software, hardware, applications, and infrastructure. Below are few

success stories compiled for this compendium, showcasing end-to-end holistic transformation. They also talk about how digital dashboards have been used in each use case by the respective leadership to assess and monitor the program.

1) Transforming Passport Services

The Passport Seva program (www.passportindia.gov.in) is one of the Indian government's largest Mission Mode Projects (MMPs) under the National e-Governance Plan, and has achieved flagship status through its sheer scale, unparalleled success and subsequent strong media attention.

Business Solution

To enable greater citizen outreach and make it easier for the citizens to visit passport offices to submit their biometrics.

153 new passport service offices are operational across India. These offices are facilitation centers that provide citizen services in a best-in-class, comfortable and secure environment.

An appointment taken via the PSP portal and token-based first-in-first-out process guides the movement of citizens at the passport offices. Scanning of supporting documents and capturing of photographs and biometrics are carried out by our staff whereas the fiduciary functions of verification and granting of the passport are performed by the government staff.

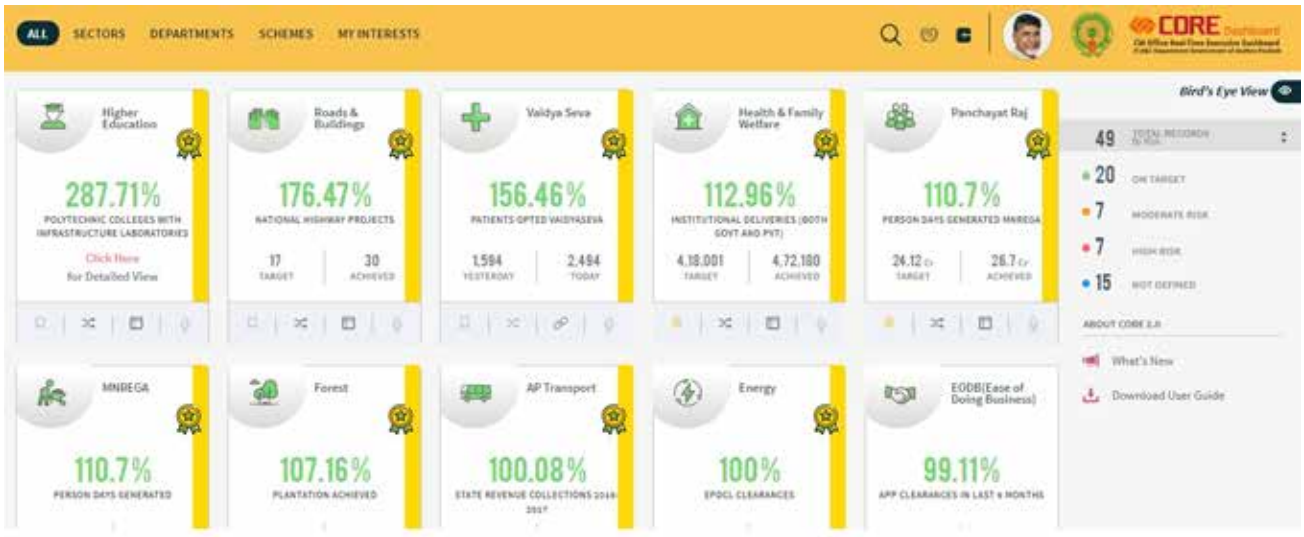
A well-designed Change and Communication management strategy ensures successful on-boarding of staff and stakeholders.

A 24X7 call center in 17 languages and an email based helpdesk addresses citizen queries and provides real time application status.

To ensure 24*7 service availability, a Tier 3 data center and a remotely located active-active disaster recovery center were established.

Front Office Services: Single point enrolment centres allow applicants to submit applications after booking prior appointments through the PSP portal. An in-built system check ensures that the captured data is accurate as well as

Mahatma Gandhi National Rural Employment Guarantee Act is India's flagship programme that provides legal guarantee of the right to employment to the rural poor



CORE Dashboard, of government of Andhra Pradesh, is a comprehensive e-governance initiative by the chief minister's office directly

compliant with international quality standards. An Electronic Queue Management System (EQMS) regulates entry to various offices, with separate queues for different citizen categories.

Back Office Services: Activities such as printing, dispatch, and tracking of passports, postal services integration, handling of complex cases, policy decisions, and counter-delivery strategies become more efficient due to automation and integration of processes.

Citizen Information Services: Multiple access channels such as a portal, mobile app, call centre and an email based helpdesk, cater to citizen queries and provide applicants with anytime, anywhere access to the latest information regarding their applications.

Multi-tier Workflow Based System: A multi-tier workflow along with built-in interoperability with external systems results in a seamless and comprehensive view of the process.

IT Infrastructure Services: The IT infrastructure at data centres, facilitation centres, and at the Network Operations Centre (NOC), ensures high availability and business continuity. An intelligent monitoring framework allows proactive identification of infrastructure, system, and security issues.

Security Framework: The security framework encompasses physical security, information security, and network security. A demographic de-duplication algorithm prevents issuance of duplicate passports.

Data Management: A centralized database across multiple passport issuing authorities gives a single view of the complete dataset of passport and related services.

Business Operations Systems: Improved business processes allow effective management of staff attendance, budgets, expenses, and inventory. Staff across teams can communicate and disseminate information, and share updates on a real-time basis.

Service Delivery Governance: There are 27 Service Level Agreements across parameters measuring external efficiencies, internal efficiencies, external, internal and technical effectiveness, environmental parameters and customer relations.

> "Dashboards present a broad, generalized approach to collecting, analyzing and acting on large data sets; allowing for smarter policy and operational decision making."

Aarogyasri is a state-funded health insurance scheme, aimed at providing cashless quality medical care to all below poverty-line families in Andhra Pradesh

Change Management Services: Comprehensive change and communication management ensures better and faster adoption of the new system.

Outcomes Achieved

Since its inception, over 54 Million passports have been issued through the PSP. Some other key PSP volume statistics are as follows:

- 22 million hits on PSP portal daily
- 50,000 citizen footfall daily
- 153 new passport facilitation centers established
- 95 million records migrated from legacy system
- 99.5 % citizen satisfaction
- 99.99 % system availability

➢ ***Reduction in processing time*** – Average passport issuance time for regular passports is 7 days, as compared to 60 days through the old system, due to digital inclusion of key external stakeholders

➢ ***Greater accountability and security*** – The use of biometric authentication as well as the use of digital signature provides for greater accountability of the staff.

➢ ***Social Impact*** – The project has an institutional team of over 6000 people. More than 2000 people were hired from small towns where passport offices are located, resulting in an individual's overall improved family earnings and social standing.

➢ ***Gender Inclusivity*** – The project has hired over 45% women - including women in senior positions, ensuing a positive impact on women empowerment and their earnings.

➢ ***Environmental Impact*** – Project's digital channels- encouraging paperless transactions, have helped save paper equivalent to 1.65+ lakh trees so far, and this figure is expected to rise by 80,000+ more trees over the next two years.

➢ ***Carbon Footprint***–Digitalchannelscoupled with extended outreach through increased

number of passport offices, have helped save INR 1720 Million in fuel to date and this figure is expected to rise by INR 750 Million in the next two years.

Governance

End to end ICT enablement and standardization of the processes related to the passport services has led to significant improvement in terms of efficiency and transparency. Apart from citizens (the passport applicants) who are the main beneficiaries, the Passport Seva System has also benefited other users of the system - the officials at CPV Division, MEA, passport office officials, police, Indian missions, immigration centers and police intelligence departments. The Passport Seva System is a centralized system and hence provides real time online access to all stakeholders from a single source. This enables quick decision making based on data and information which is current and easily accessible. Various MIS reports and dashboards give the officers and staff a clear visibility into various parameters such as pendency across the life-cycle with reasons thereof, staff productivity, demand for passport services, and appointment availability etc. This real time access to information through intuitive dashboards and reports has helped in timely and effective decision making.

Strategies for Future

Today, India's passport services are set to scale new frontiers, with technology innovations shaping the passport issuance process. Some of the initiatives in pipeline are:-

- Extending passport services network to include post offices as citizen service delivery channels.
- Having a global uniform passport issuance system for all Indian nationals
- Introduction of e-Passport
- Integration with other government databases for online validation of documents submitted by passport applicants
- State-of-the-art high speed printing facilities

2) Employment Benefits: Rural Employment Guarantee

Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) is India's flagship socially relevant programme to combat poverty. It provides legal guarantee of the right to employment to the rural poor. MGNREGA framework, an end-to-end IT solution, has successfully automated Andhra Pradesh government's rural employment guarantee scheme. A web-based data centre aids in the monitoring and reviewing of the scheme on a continuous basis.

The solution implemented in Andhra Pradesh and Telangana has achieved the following objectives:

- Brought transparency in implementation of the scheme
- Reduced frauds significantly
- Improved efficiency in processes
- Strengthened rural governance

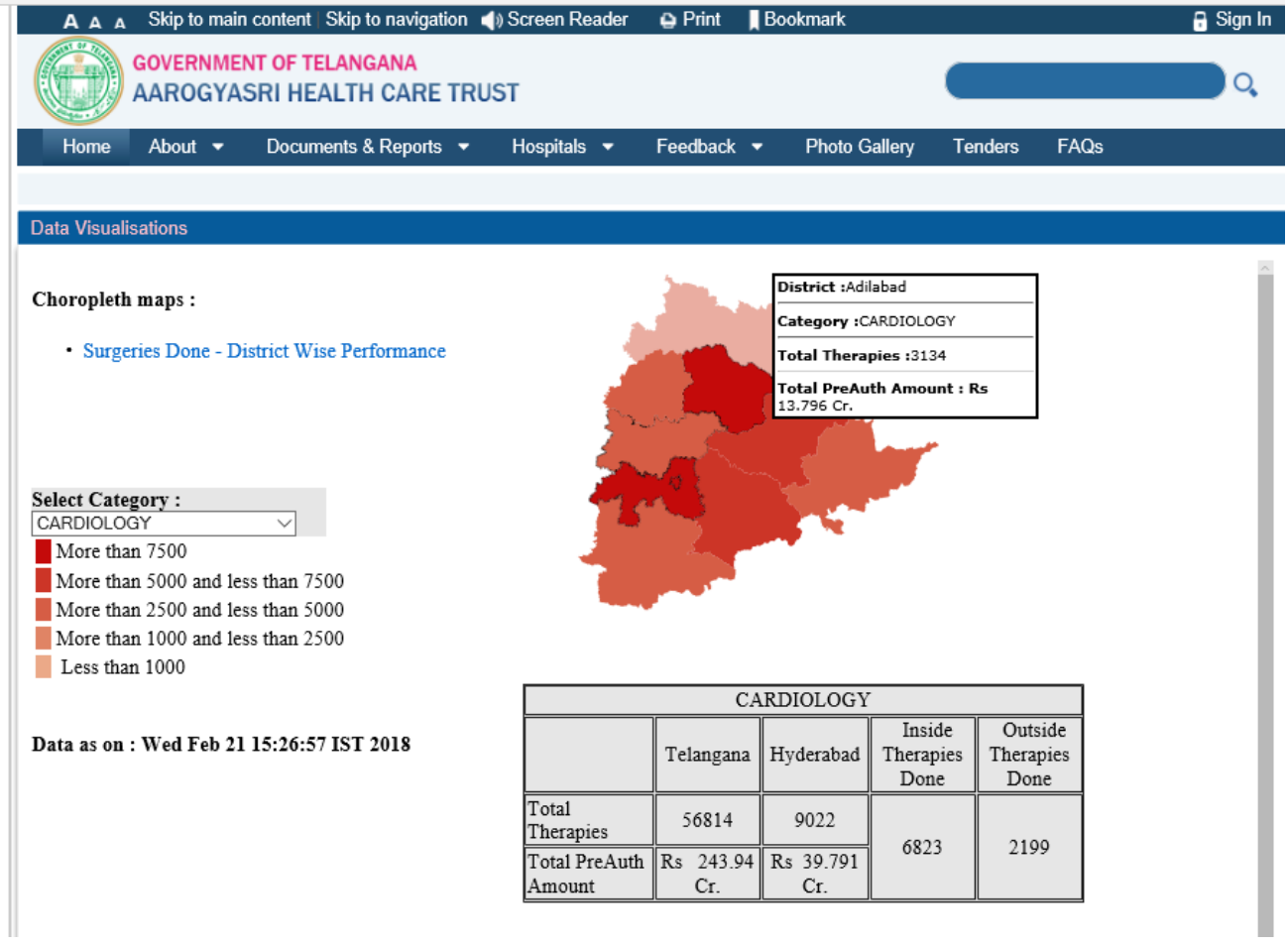
Aarogyasri public portal (www.aarogyasri.telangana.gov.in) has all the information related to the scheme and real time statistics.

- Enhanced livelihood security of households
- Arrested rural migration
- Created rural assets
- Created livelihood resource base
- Restored environment
- Empowered People – Demand for work is made right of people
- Provisioned Unemployment Allowance if employment not provided within fortnight
- Facilitated faster and accurate wage payments with pay slips and alerts
- Ensured online payments tracking
- Delayed compensation amount is automatically added to the next pay slip
- Provided assistance with local language interface

Benefits

- Created a database of about 14 million households with more than 30 million job seekers of Andhra Pradesh and Telangana
- Paid more than Rs. 53,000 Cr through the system
- Transparency in transactions
- Increased accountability
- Fraud Reduction
- Reduction of effort and administrative costs
- Accurate and faster wage payments

> "Some dashboards are public: aarogyasri.telangana.gov.in shows a range of real-time KPIs and data, with logins given to officials for drilling down further"



CARDIOLOGY				
	Telangana	Hyderabad	Inside Therapies Done	Outside Therapies Done
Total Therapies	56814	9022	6823	2199
Total PreAuth Amount	Rs 243.94 Cr.	Rs 39.791 Cr.		

(Picture)

Governance

MGNREGA program execution is monitored by the Chief Minister and the PR&RD Minister of Andhra Pradesh along with other government officials. The MGNREGA Web Portal (http://www.nrega.ap.gov.in) has detailed MIS section for the government officials and public. The Data is also transmitted in real time basis to the Minister's Dashboard (http://www.mydepartments.in/PRRWS/MGNREGSDashboard) and CM's CORE Dashboard.

3) Health Insurance for Poor

Aarogyasri is a state-funded health insurance scheme for below the-poverty-line (BPL) citizens in Andhra Pradesh, India. The goal is to provide cashless quality medical care to all BPL families of the State through:-

- Purchase of quality services from private market
- Strengthening government hospitals

Benefits

- Sum insured per family - Rs.1,50,000/- per year
- Benefit on floater basis can be availed by individual or family
- Additional buffer amount of Rs. 50,000/- available, in case of need

The paddy procurement system ensures remuneration of Minimum Support Price (MSP) for the paddy procured by the farmer

Scheme Features

- Universal Coverage – to all the BPL families of the state
- Cashless Treatment – upto 2 Lakhs in a year per family
- Therapies – 938 identified procedures
- Choice of Hospital – prerogative of the patient
- Approvals – online approvals within the Service Level Agreement (6 hours for pre-authorization)

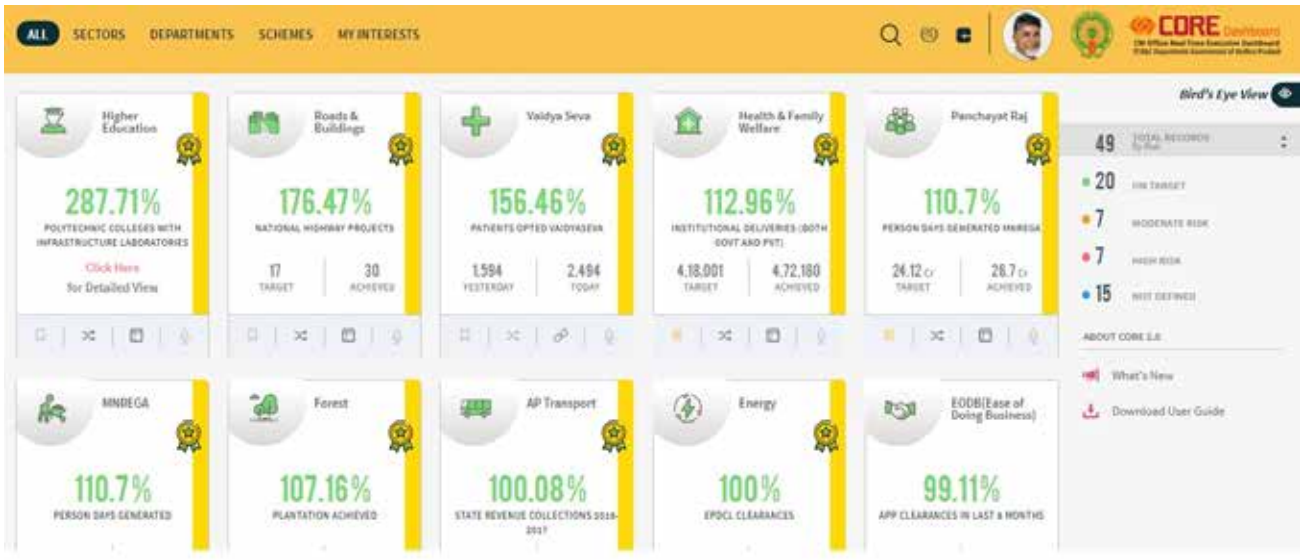
Outcomes Achieved

- Quick, accurate & effective decision making
- Enhanced efficiency & productivity
- Fraud detection
- Data analytics
- Standardized procedures & guidelines
- Enhanced medical facilities in government hospitals
- Online monitoring and evaluation

Governance

The Aarogyasri program is being monitored by the Chief Minister and the Health Minister of the Government of Telangana along with other government officers. Aarogyasri public portal (www.aarogyasri.telangana.gov.in) has all the information related to the scheme and real time statistics. The portal has operational, statistical and analytical dashboards which provides continuous inputs for efficient monitoring of the scheme all over the state. There are separate login credentials allocated to the officers to view key performance indicators of the scheme. Following are the key performance indicators that government looks into:

1. Coverage Density NHPS: percentage of covered families to total target families



The paddy procurement system is integrated with Andhra Pradesh's Chief Minister's CORE Dashboard for providing real time update on the procurement status

2. Percentage of pre-authorization approval that got rejected to total pre-authorization requests
3. Average length of stay of all inpatients excluding day case and observation patients
4. Percentage of individuals who have exhausted the coverage limit
5. Occupancy Rate: proportion of beds occupied as a percentage of total beds available under the program
6. Readmission Rate: percentage of all patients readmitted to the same facility for the same condition within 30 days of discharge
7. Case fatality rate

4) Food Grain Procurement

Objectives

- Ensure the remunerative price / Minimum Support Price (MSP) for the paddy procured by the farmer.
- Optimum utilization of funds
- Real time procurement status

> "Analytics help transform data from billions of citizen-government transactions into knowledge for empirical, rather than anecdotal, decisions."

- Transparency in procurements and payments
- Track of payments – up to farmer level
- Control on paddy transport to mills
- Control on private vehicles for paddy transport
- Online delivery status

Outcomes

- 93% payments happening within 7 days
- Infused transparency and accountability in implementation
- Farmers are getting Minimum Support Price at procurement centers
- Administrative costs have been reduced drastically as manpower from the manual system are reduced

- Created a database of about 5 lakh paddy farmers in Andhra Pradesh
- Online paddy payment of about Rs. 24,000 Cr has been made through the system, since its inception in 2015

Governance

The paddy procurement system is integrated with Andhra Pradesh's Chief Minister's CORE Dashboard (http://core.ap.gov.in) for providing real time update on the procurement status for review. The detailed analytics on procurements and payments are available in the Civil Supplies Department section of the CORE dashboard.

The Road Ahead

With citizens becoming increasingly tech-savvy and always 'connected', governments need to bring about a paradigm shift in their approach to public service delivery. Digital technologies such as social media, mobility, analytics, and cloud will be the epicentre of public service delivery. These digital technologies offer truly transformative possibilities, such as:

- ***Better collaboration through Social Media***: social media enables virtual discussion groups among citizens, and helps increase government outreach with two-way collaborative communication in near real-time.
- ***Mobile Governance***: Mobility enables the provisioning of the 'anywhere, anyhow, anytime' model for public service access and delivery.
- ***Insights driven public service delivery***: Analytics help transform data from billions of citizen-government transactions into knowledge for empirical, rather than anecdotal, decisions
- ***Building new business models with the cloud***: Cloud computing allows for one-to-many system deployment through a 'build once, use many times' approach that reduces implementation time and the lifecycle cost of IT systems.

A Digital by Default approach to citizen service delivery must be holistic and integrated to achieve the desired outcomes. Digital Governance through various emerging technologies might allow the governments to understand its citizens' needs more intimately, allowing the state to streamline existing modes of public service delivery to suit needs more efficiently.

21st National Conference on e-Governance

Emerging Technologies

Tackling Tomorrow's Cyber Threats

Security by Design: Ensuring Resilience in e-Governance

Developed by

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Symantec

Tackling Tomorrow's Cyber Threats

Security by Design: Ensuring Resilience in e-Governance

Governments are treasure troves of information with strategic, tactical and commercial implications. Therefore, they face complex and increasing number of severe attacks in the cyber ecosystem.

Recently ransomware and file-less attacks have emerged as new threat vectors in addition to the conventional ones like phishing, defacements, malware and distribute denial of service (D-DoS) attacks. Incidents like crippling of energy grid in Ukraine raise new concerns even as the 2007 cyber-attacks on Estonia are still fresh in memory.

Newer, emerging and distributed technologies including the internet of things (IoT), machine to machine communication (M2M), artificial intelligence (AI), big data and blockchain will also open up the landscape to newer forms of threats and attacks.

With proliferation of e-governance services, interlinking of various systems and increasing number of websites and mobile apps (often developed and maintained by third parties and with little supervision), the probability of attacks in India has significantly expanded.

Fostering Trust in e-Governance Through Cyber Security

As India looks at "Technology driven innovation" focused on "reform-perform-transform" it is critical to foster trust in e-governance. People expect demonstrable assurance that such data would be prudently protected from rapidly increasing cyber-attacks.

A fundamental component of successful e-governance is about identity management and protection of data from cyber-warfare. As a matter of fact, Aadhaar (meant for residents) indeed puts India in a massive competitive advantage versus countries that lack a central registry of identity like the UK. In addition, India has identity registries like the national population register (meant for citizens), electoral rolls and income tax permanent account number (PAN) holders.

Emerging Tech: Pros and Cons

Government of India is considering use of emerging technologies such as the internet of things (IoT); machine to machine communication (M2M); artificial intelligence (AI), big data and blockchain. Leveraging these with the use of cloud infrastructure and mobile apps would make e-governance easy, affordable, scalable and more secure without the major upfront investment that the client-server model historically required. Eventually, this will also catalyse emergence of innovative solutions, most likely from startups.

However, like any other technology, these can also be utilized for both good and bad. If the implications of these new technologies are not thought through, it may lead to certain unforeseen risks such as dark clouds or the usage of mala fide AI against bona fide AI".

Data Protection and e-Governance

Governments collect, store, use and share lots of data about or from the individuals but they are expected to perform it responsibly. In view of the hon'ble Supreme Court's judgment holding privacy as a constitutional right and the committee of experts set up by the government for developing a framework for data protection in India, the following points should be duly considered:

- With increasing digitization, a robust data protection framework is a sine qua non to ensure the efficacy of the right to privacy. Hence, it should be evident that robust cyber security is required to ensure data protection.

- The data protection framework should apply to both the public sector and the private sector like in other advanced jurisdictions. It is pertinent to mention here that this is also the provisional view of the aforementioned committee of experts as mentioned in the white paper released for public consultation in November 2017.

Hence, the government entities can and should become a role model for ensuring and assuring privacy through deployment of best-of-the-breed technologies, processes and people. They must adhere to the underlying principles of data protection framework.

> "Newer, emerging and distributed technologies including IoT, M2M, AI, big data and blockchain will open up the landscape to newer forms of threats and attacks."

These include fair and lawful processing; purpose limitation; collection limitation (adequate, accurate and relevant yet not excessive; e.g. it is not clear why 'marital status' is a mandatory field for creating a user login at the IRCTC website for railway reservation); retention limitation and the obligation to take appropriate technical and organizational measures against unauthorized or unlawful processing of personal data and against accidental loss or destruction of, or damage to, personal data.

This includes data classification, encryption and use of data loss prevention techniques as well as ways and means to restrict unauthorized access to data and having the ability to trace back and audit. e-Governance ecosystem is a natural target for cyber-attacks. Hence, it is essential to consider security at the design stage and adequate budgeting by default to foster and sustain trust as well as to ensure its resilience.

- All the six bases mentioned in the white paper on data protection framework in

(Pic: 123rf © Prasit Rodphan)

India for processing should be available for both public sector and the private sector entities, namely consent, performance of contract, compliance with a legal obligation, protection of vital interest, public interest, and existence of a legitimate interest (including prevention of financial fraud, critical information infrastructure protection and ensuring cyber security).

- Accordingly, when it comes to data protection, there should be absolutely no difference in obligations of a public sector airline or bank vis-à-vis their respective private sector counterparts. All the same, even if law enforcement agencies may not need consent for their lawful purpose they are still accountable for data breach notifications and hence, must take security of the data they have seriously.

Of course, the legitimate interests of the state can be served through relevant exemptions for entities tasked with the exclusive task of national security and intelligence.

The Paradigm Shift: From Protection and Detection to Prediction and Resilience

For decades, anti-virus (AV) solutions detected signatures of 'known' viruses and provided formidable protection to the end points like computers. As new viruses and their variants emerged, the updated AV patches could effectively catch up.

However, with the increasing sophistication and speed of attacks that often combine multiple threat vectors and social engineering, reliance on signature-based solutions alone can be self-limiting and even counter-productive since the economics of compromising such an ecosystem are on the side of the attackers.

Instead, a holistic approach to cyber defence is needed, especially so in the government. This spans identification, protection, detection, response and recovery as detailed in the NIST cyber security framework (NIST framework).

It would not be out of place to mention that the European Union's directive on network and information systems (the NIS directive) and the recently passed cyber security act in Singapore also strive for critical infrastructure protection to ensure that there is resilience, response and readiness.

In India too, the national critical information infrastructure protection centre (NCIIPC) has been notified as the national nodal agency under the IT Act and has already issued useful guidelines for the same. Similarly, three out of the four regulators for the financial services, the Reserve Bank of India (RBI), the Securities Exchange Board of India (SEBI) and the Insurance Regulatory and Development Authority of India (IRDAI) have already detailed cyber security frameworks for their respective stakeholders.

In addition, the government has set up a dedicated computer emergency response team under the aegis of the national informatics centre (NIC-CERT) to specifically focus on cyber security within the government. However, such measures need to be augmented further with adequate and timely legislation and regulation as well as by way of investing in technology, process redesign and capacity building.

Looking beyond historical signatures to dynamic behavioural analysis and reputational reviews in a highly kinetic scenario would necessitate gleaning and imbibing intelligence from credible sources and being on top of the situational awareness. In this context, public-private partnerships come in extremely handy as long as those are voluntary, bilateral and reciprocal.

Best Practices: Assuring Cyber Security & Data Protection

So, what should the government do to enhance and ensure cyber security? Ultimately, cyber security is about managing risk and hence, it needs to be continuously assessed, evaluated, monitored and responded to accordingly.

> “Good encryption ensures that any data stolen will be virtually useless to cybercriminals. In fact, encryption enhances both security and privacy.”

It is always best to factor in cyber security (and as an extension, data protection) at the design stage itself for any technology intervention or enablement and budgeted for adequately rather than as and after-thought and thereafter, scramble for funds. As a matter of fact, despite being rated as the global leader in the cyber security index by the UN body ITU , Singapore's national cyber security strategy unveiled in October 2016 mandates 8% of ICT budgets to be set aside exclusively for cyber security in every government project.

Closer home, the state of Haryana became the first one to set aside 10% of its technology budget for cyber security in its cyber security policy 2017, as recommended by the NASSCOM cyber security task force set up in response to the specific ask by the Hon'ble Prime Minister on the occasion of its silver jubilee.

Here is a collation of best practices that can all be traced back to the mantra 'security by design, budgeting by default'

Consistent Policy Framework

Forward-looking, risk-based and flexible policy framework is essential to ensuring the best outcomes from the public policy perspective. Various policies and regulations must be mutually exclusive yet collectively exhaustive to the extent feasible and have requisite cross-references as necessary to ensure consistency and predictability.

For example, the upcoming data protection framework should leverage, reference and align with the national policy on information technology 2012 ; national telecom policy 2012

(Pic: 123rf © Michal Bednarek)

; national cyber security policy 2013 ; national data sharing and accessibility policy 2012 and the national information security policy guidelines (NISPG) as well as with legislations such as the information technology act ; the Indian telegraph act, the official secrets act and the right to information act . Likewise, we need greater clarity and consistency on use of encryption.

Basic Security Steps

Cyber security starts with the basics. Though criminals' tactics continue to evolve, importance of good cyber hygiene cannot be overemphasized. According to a report from the online trust alliance, 90 percent of breaches could have been prevented if organizations implemented basic cyber security best practices. These include using strong and different passwords for different services; encrypting data at rest and in transit; using data loss prevention tools; using multi-factor authentication; and, running modern and updated security software.

Within India, we have already seen benefits of second factor authentication (2FA) mandate for all card not present (CNP) transactions in the form of relatively low fraud rates. Also, the de-coupling of authentication and entitlement using Aadhaar is another example of an emerging best practice.

Pirated software is often a conduit for malware. Hence, the entities must always use genuine, licensed and updated software. While so-called "zero day exploits" previously unknown critical vulnerabilities get the most media coverage, it is the older, unpatched vulnerabilities that cause most systems to get compromised.

Modern Security Software

Modern security software is way more than the conventional anti-virus: it monitors systems continuously, watching for unusual traffic, activity, or system processes that could be indicative of malicious activity. Reputation-based and behaviour-based heuristic security technologies provide even more advanced protection.

Web isolation tools help execute web sessions away from endpoints, sending only safe rendering information to government users' browsers thereby protecting against zero-day malware being delivered from a website. Government enterprises should also use tools that can examine, isolate and alert if they come across malware even if encrypted.

Tailoring Security to the Device

Though most people do appreciate the need to protect the laptops and desktops, most of the mobile phones have no protection at all. A mobile phone is a computer both legally and technically and actually, more vulnerable due to their usage outside the official premises and more prone to physical theft or damage. Hence, mobile devices used by government officials must have suitable security solutions.

It is encouraging that the government is planning to set up half a million Wi-Fi hotspots to provide free Internet access but this must be accompanied with ensuring security as well. Likewise, restraining or locking down the features not relevant in the context (like in a PoS terminal or ATM) reduces the attack surface thereby making several dangerous strains of malware totally useless.

Encrypting and Monitoring Data

Even the best security will not stop a determined or resourceful attacker, and encrypting important data provides defense in breadth. Good encryption ensures that any data stolen will be virtually useless to the cybercriminals. In fact, encryption enhances both security and privacy.

Cloud First: Let the Data Flow Across Borders

As the government is focusing on developing cloud-ready applications and cloud infrastructure, it should recognize that what really matters is the timely and effective access to data for security and law enforcement rather than mere location of the data within the territorial boundaries of the country.

In this context, the pragmatic approach of the reserve bank of India (RBI) is worth emulating. RBI allows sharing of IT resources and use of outsourcing and cloud computing by the banks, subject to due diligence for risk assessment and a clear understanding that the banks continue to be obligated for compliance with the existing regulations.

Use of Official Credentials

It is crucial that the government officials communicate in their official capacity using their official mail ID itself in compliance with the government's email policy. This would ensure alignment of access rights with the appropriate authority while also enhancing accountability and effectiveness. Use of digital signatures for signing the government documents would make them secure, legally valid and non-repudiable.

> "Government employees must use official email IDs and systems: using personal email for official work is unsafe and a potential entry point for hackers into other government resources"

Conclusion

The bottom line in cyber security is no different from physical security – nothing is perfect. We can make it very hard, for an attacker, but resourced and persistent criminals would probably find a way. Hence, good security means not just doing the utmost to keep them out, but also to recognize that we must take steps to limit any damage they can do should they get in while also being in the state of readiness to respond quickly and effectively.

The old saying "A Stitch in Time Saves Nine" is still true!

Emerging Technologies

Managing Tomorrow's Cities

How IoT and edge analytics can help transform the governance of cities, making them smarter and safer

Developed by

Author:

Vikas Hooda
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Hewlett Packard Enterprise

Managing Tomorrow's Cities

How IoT and edge analytics can help transform the governance of cities, making them smarter and safer

Smart City Governance

Smart cities are urban areas that use digital technologies in a secure fashion to manage the municipality's assets, enhance sustainable economic development, reduce costs and resource consumption, and support the well-being of its citizens. Smart cities have become a global phenomenon, and municipal leaders around the world are interested in the potential opportunities as they prepare their cities for the future.

Beyond marketing and technology, an effective smart city strategy takes a city's cultural, socioeconomic, geographical and environmental realities into account and requires collaboration between stakeholders from policy makers to citizens with assistance from trusted, experienced, information and communication technology partners.

Innovation and the proper implementation of new technologies into a smart city strategy requires careful contemplation. Technology partners play a pivotal role in the project's development and implementation, and therefore its ultimate success.

This white paper talks about how Internet of Things, Edge Analytics bringing the efficiencies to the city operations and setting vision for smart cities' governance.

Digital Revolution

By 2050, 70 percent of the global population will live in urban areas. Fortunately, the digital revolution holds great promise for responding on many of the challenges created by inexorable urbanization. IoT in particular offers far-reaching opportunities to change the trajectory of asset and resource management and usage to help cities become more efficient and sustainable as demands increase.

A key goal of a smart city is to enhance the use of public resources, increasing the quality of services offered to its citizens while reducing operational costs. While this objective cannot be achieved with technology alone, leveraging the deployment of IoT within a city can go a long way for reaching this goal.

Leading to New sources of Value Creation and Capture

McKinsey Global Institute forecasts that the potential direct economic impact of IoT in cities could approach $1.7 trillion by 2025. The evolutionary trajectory, from limited-capability M2M services to the super-capable IoT ecosystem, has opened up new dimensions and opportunities for traditional communications infrastructure providers and industry-specific innovators.

Those exploiting the potentials of this technology to introduce new services and business models can achieve outstanding outcomes with existing services and, in many cases, transform their operations to match the needs of a hyper-connected world. This is particularly true within a smart city.

IoT as a Key Technology Enabler

IoT has the potential to facilitate beneficial decision-making that no stand-alone device could collect and process on its own. Example: merging data from weather, traffic, and environment sensors to predict and manage air quality along major roads and networks.

The treasure trove of data coming online for the first time is without value, however, unless the devices generating the data can be managed and the data itself can be verified as trustworthy, analyzed, and monetized into new revenue streams, cost savings, or improvements in user

IoT is a Network of Physical Things Embedded with Sensors, Softwares and Electronics.

experience. Without all of that, the true value cannot be fully realized.

The explosion of connected objects will not only depend on the appropriation of uses, but also on the management of radio frequency congestion, network capacity, and how public and private networks are interconnected. Across a smart city, different use cases will likely require different types of connectivity. For example, an IP surveillance camera requires the high bandwidth available from cellular, Wi-Fi, or fixed-line connectivity, whereas smart parking sensors require long battery life and therefore a low-power connectivity method such as LoRa.

IoT is already delivering benefits to cities which have experienced energy savings of more than 60 percent by moving to smart street lighting. Coming smart cities have seen similar significant savings by deploying smart waste management solutions, reducing CO2 emissions, and increasing citizen satisfaction through smart parking and traffic management.

> “IoT has the potential to facilitate beneficial decision-making that no stand-alone device could collect and process on its own.”

In many cases, however, these are only isolated point solutions. To truly exploit the benefits of IoT within a smart city, a holistic approach is required such that the infrastructure deployed is flexible enough to support multiple use cases rather than building multiple silos.

As such, a thorough study of setting up IoT networks and solutions is needed to respond adequately to specific smart city project requirements. Policy makers must fully comprehend and organize the interaction between IoT systems and multiple connectivity networks to accelerate the transformation of data these systems generate into value and services.

The smart city represents an extensive melting pot of innovation potential. Several cities are already driving knowledge exchange in schools, universities, and laboratories. Innovation labs are expected to marry technology innovation to services and business models to create more contextualized residential and enterprise benefits.

Smart Cities IoT and Analytics at the Edge—Use Cases

Use cases such as smart street lighting where savings can be quickly realized in terms of energy consumption and reduced downtime have become commonplace in many municipalities, as have smart parking, environmental monitoring, and traffic management.

Many cities are now looking to expand the use of IoT to improve services like waste management, water management and quality, and energy consumption in public buildings, affordable health care services are key areas. Additionally, the use of contextual analysis to provide real-time information to citizens and authorities are growing in popularity.

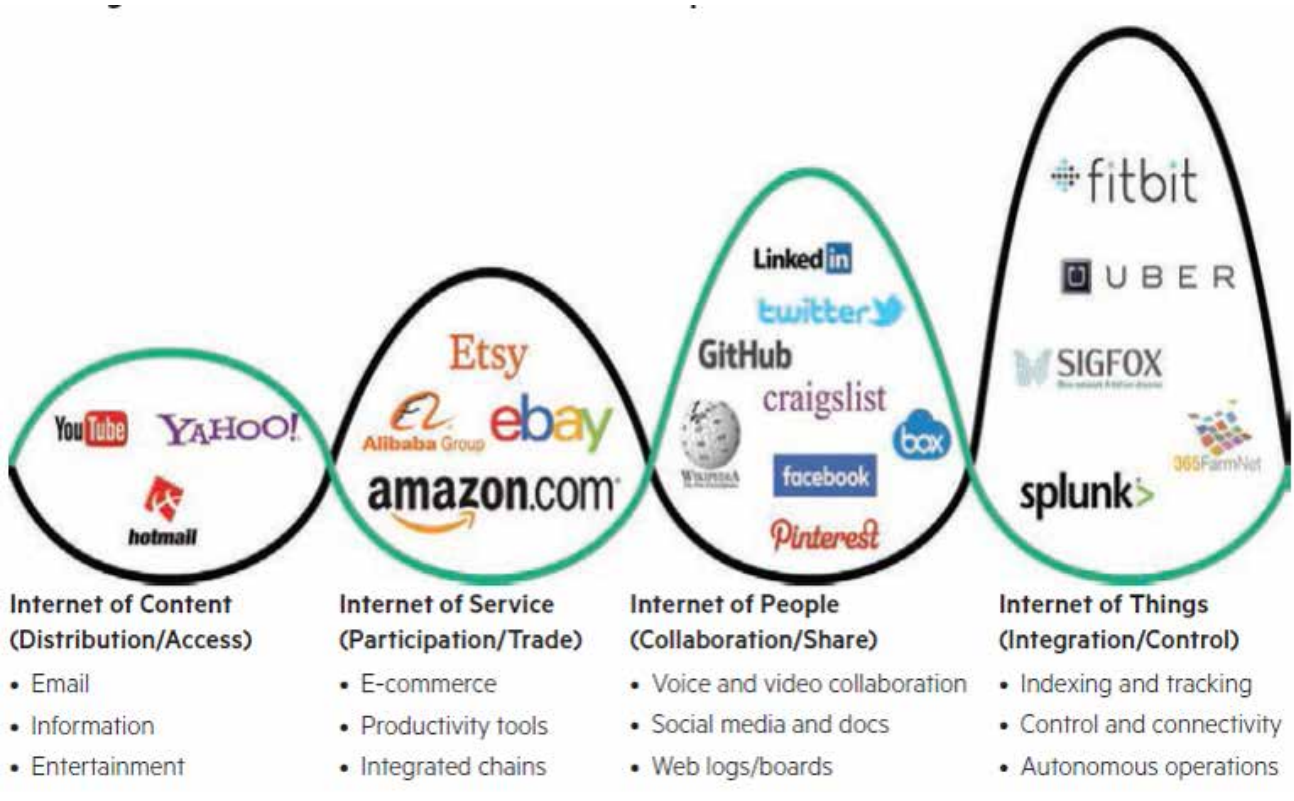
Smart Traffic Management

Every city and town have challenges in maintaining smooth flow of traffic. The available solutions proposes the following functionalities while designing the intelligent traffic management system

- Traffic management system
- Traffic maps
- Accident information
- Traffic choking information
- Mobile apps for bus routes, timings etc.
- Integration of cameras for the automatic challan generation
- Automatic number plate recognition
- Vehicle color recognition
- Lane changing alerts

Some of the key drivers of the smart traffic deployments possible with the rapid pace are

- Rapid development of wireless technology (both cellular and LPWAN)
- Ability to analyze volumes of data collected from parking and other sensors (such as traffic)
- Edge Analytics availability with parallel



IoT represents the next wave of the internet by and creates a platform for taking in the massive volumes of data (Source: HPE IoT Smart City Business white paper)

processing on next generation compute to manage the scenarios in live environment.

- Availability of technology at affordable prices

Solid Waste Management

Challenges of Municipal Corporations in Solid waste management has become a big challenge for any municipal corporation as it involves men, machinery, and mobile resources. Managing people responsible for the activity and proper utilization of assets/resources assigned to them has become a complex job for the administrators. The main problems of the existing solid waste collection process are:

- Lack of information about the collecting time and area.
- Lack of proper system for monitoring, tracking the trucks and trash bin that have been collected in real time.
- There is no estimation to the amount of solid waste inside the bin and the surrounding area due to the scattering of waste.
- There is no quick response to urgent cases like truck accident, breakdown, longtime idling.
- There is no quick way to respond to civic complaints about uncollected waste.

> "A key goal of a smart city is to enhance the use of public resources, increasing the quality of services offered to its citizens while reducing operational costs."

Technology to Overcome Challenges

Municipal Corporation can overcome the above challenges by using the modern technology using Internet of things, Analytics running at the edge by using GIS, GPS and technologies like RFID for the tagging etc.

- To manage routes and vehicles dynamically through an automated system.
- Real time management of missed garbage collection points.
- Efficient monitoring and management of waste collection bins.
- Route optimization can be done which will help in reduction of trip time, fuel saving and serving more locations.
- To reduce the human intervention in monitoring process.
- To keep history of vehicle routes, attended sites and other details.
- To integrate the dumping ground and transfer station facilities with the centralized locations.
- To monitor other vehicles such as road sweeping vehicles.
- To ensure complete coverage of door to door and community collections.
- To monitor and track other municipal vehicles such as dumpers, water supply tankers etc.
- Reporting of vehicles, garbage collected and other solid waste management details to higher authorities from any location at any time.

Solution Approach

The solution should bring great effectiveness in managing manpower and vehicles and also improves public satisfaction by achieving the following goals:

- Create routes for each vehicle to cover and monitor route compliance
- Supervisors can send the designated routes to each contractor vehicle on a mobile application to cover the assigned area/ streets.
- Real time tracking of the trucks and helps to generate trip views of particular truck

Cities: Potential direct economic impact of $930 billion to $1.7 trillion per year by 2025

Sized applications	Potential economic impact, $ billion annually; Total = $930 billion–1.7 trillion	Assumptions	Potential value gain[1]
Air and water monitoring	403–693	Value of lives lost to pollution ~$7.6 trillion/year	15% reduction
Adaptive traffic management	223–504	Time spent in cars/looking for parking ~$3.9 trillion/year	10–15% less time in traffic; 10% reduction in congestion from smart parking
Autonomous vehicles (fully and partially)	204–235	Auto deaths, injuries $3 billion; ~$800 billion in fuel; 311 million hours in traffic/ searching for parking	~40% accident reduction (90% in fully autonomous), 10–15% fuel /CO_2 savings
Resource/ infrastructure management	33–64	$1 trillion/year for electricity and water, plus street lighting and infrastructure maintenance	35% fewer electric outages; 50% reduction in water leaks; 10% reduction in theft
Disaster/emergency services	24–41		xxx
Public transit schedule management	13–63	Up to 70% of commuting hours are buffer time	Reduction in buffer time via connected bus/train data; condition-based maintenance
Human productivity (organization redesign, monitoring)	3–6	~$670 billion in mobile and knowledge worker wages	5% productivity gain for mobile workers, 3–4% for knowledge workers
Crime detection and monitoring	14–31	~$440 billion cost of crime	20–22% reduction
Smart solid waste pickup	5–9	~$65 billion/year cost	23% productivity improvement

1 Ranges of values are adjusted for estimated potential penetration of IoT applications in advanced and developing economies (0–100%).
NOTE: Estimates of potential economic impact are for sized applications and not comprehensive estimates of potential impact. Estimates include consumer surplus and cannot be related to potential company revenue, market size, or GDP impact; estimates are not adjusted for risk or probability. Numbers may not sum due to rounding.

Domains such as Air and Water Monitoring, Adaptive Traffic Management, and Autonomous Vehicles are Expected to Have the Highest Potential Economic Impact as Shown Above (Source: McKinsey Global Institute Analysis)

- Find out streets/areas covered and not covered by the trucks
- The system automatically counts the number of trips made by each truck to the dumping site.
- Supervisors can generate trip reports with distance travelled by each truck for payment
- Mobile application will be given to the public to report uncollected solid waste from the streets. The system receives information with location from mobile app. Supervisors can immediately take necessary action to clear the solid waste

form the reported location and work in line with Swachh Bharat Abhiyan Mission.

- The system is scalable to increase number of vehicles and create new dumping sites on as and when required.

The system is scalable to introduce solid waste bins and also provide RFID tags for bin identification and find out bin clearance status.

Efficient, Effective and Affordable Healthcare

The health of a city is judged by the health of its citizens. Great cities have been built on the framework of exemplary citizen healthcare. Healthy citizens form the core of a vibrant prosperous city that grows constantly and spurs the economy of the nation.

The challenges of providing effective healthcare to citizens is a common one across the world particularly in developing nations and India is no exception. Inorganic growth of new cities has exacerbated the problem due to the vast influx of migrant populace that arrive looking for better opportunities and better life.

Roughly 75% of the country's healthcare infrastructure—hospitals, clinics, medical personnel, and other healthcare resources—is heavily concentrated in major metros, putting it out of easy reach for all but 27% of the population. Nearly 90% of Indian patients must travel more than 8 kilometers to access basic medical treatment.

The State of Primary Health Care facilities

The primary healthcare centers (PHCs) and government-run systems that do exist in these communities commonly lack the capacity, staff, and referral systems to provide high-quality care. India's infrastructure for primary healthcare yields roughly one PHC for every 30,000 people, and only one sub-center for every 5,000 people.

Many lack electricity or electronic communications systems to connect with better-equipped facilities in urban centers. The resources that PHCs do offer—such as prescription drugs and medical diagnostic equipment—are often sparse and unreliable.

Even if existent, they are mostly isolated and lack the connectivity and continuance to an equipped hospital. In effect, making affordable healthcare extremely difficult or non-existent to the common man.

There is a need for mass rapid deployment of healthcare infrastructure that is effective, efficient and is responsive to the needs of the citizens at the point of need.

> "By embracing new capabilities, services, and solutions, municipalities and authorities alike can deliver a standardized end-to-end platform, create new services in the industries of their B2B/B2C/B2B2C customers"

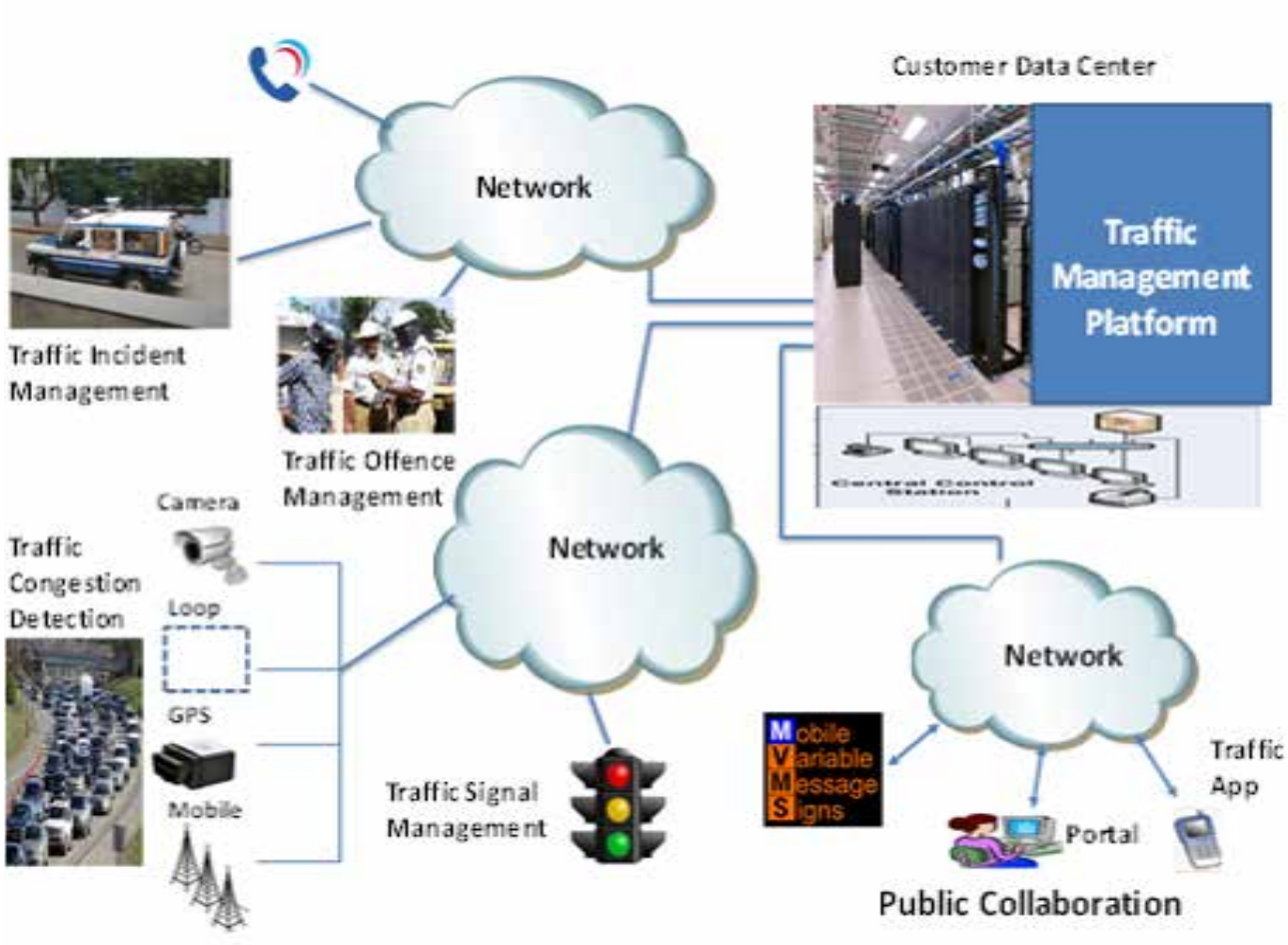
The Approach

Using technology like cloud, IoT, Big Data, Analytics and expertise to improve access to primary healthcare in underserved areas around the world.

There has to be a simple, easy to deploy and rapidly scalable solution built on a framework that leverages cutting edge concurrent technologies to provide the best of healthcare infrastructure at affordable costs to citizens.

We should think of a health care solutions by using a blend of technologies :

- Cloud technologies for remote access & ubiquitous delivery
- Mobility for pervasive access
- Machine to machine data possibility by using IoT, Big Data for real time , purpose built analytics
- Dashboards for real time data representation & trending analysis



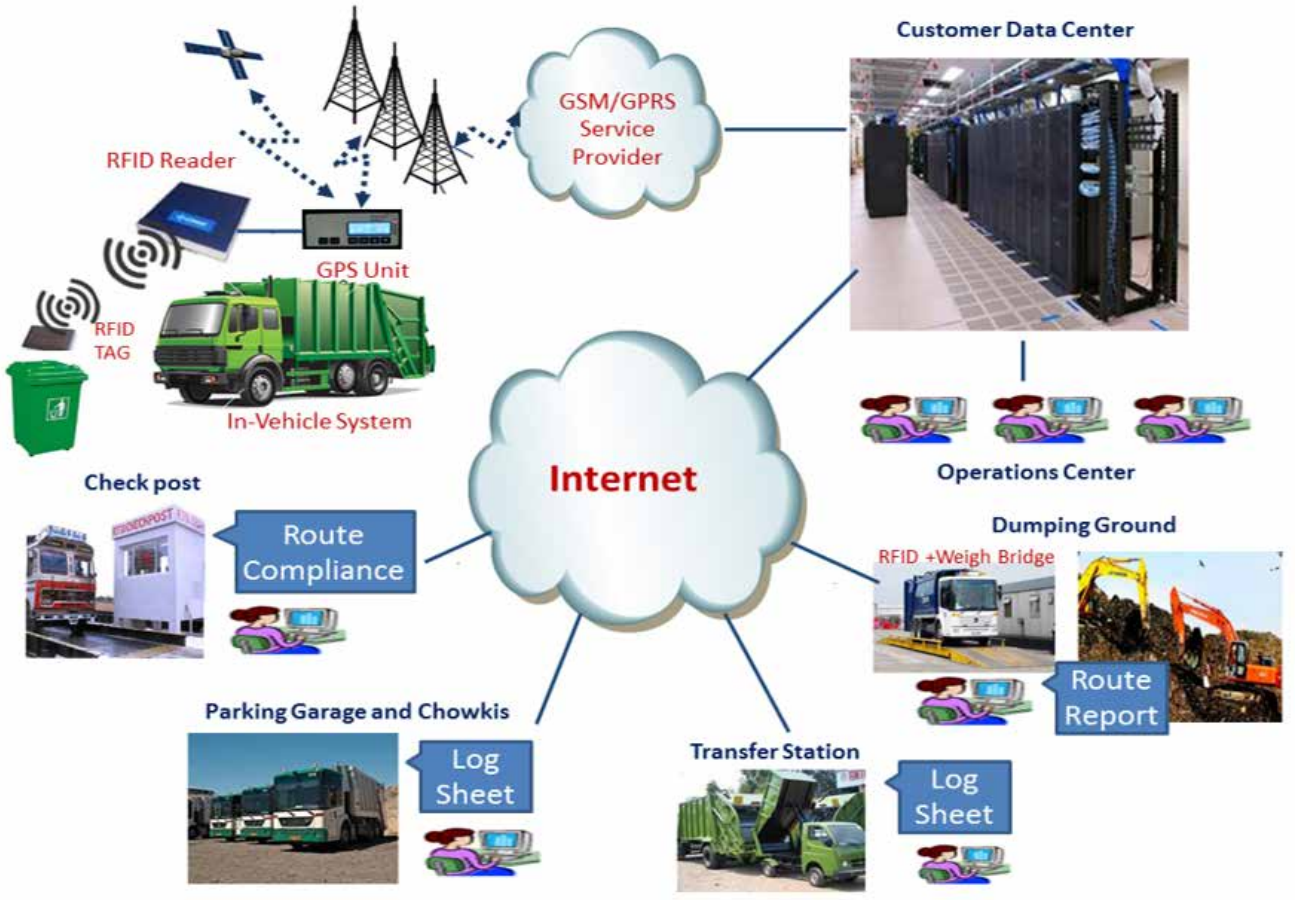
IoT is Bringing the Traffic Management System of Smart Cities Manageable for the Government Authorities (Source- igovernment.in)

The health care solution that combines the best of health & IT domains is the need of the hour. By providing underserved populations with access to quality, affordable healthcare, solution should plays a critical role in contributing to healthy, vibrant communities and spurring economic growth is the need of the hour. The solution should assists government efforts to maintain and expand local & national healthcare initiatives.

- Delivering 21st-century healthcare to underserved populations
- Leveraging the power of the cloud to transform access to quality, affordable healthcare
- Assisting governments with community-wide health monitoring and management

The solution would be able to provide the tools and technology that government entities and communities need to proactively mitigate the threat of an epidemic with real-time disease surveillance. It also helps policy makers understand the big picture from aggregated health data so they can better shape future healthcare policies.

> "McKinsey Global Institute forecasts that the potential direct economic impact of IoT in cities could approach $1.7 trillion by 2025"



IoT Navigating the Smart City Infrastructure Towards the Digitally Operated Platform (Source- igovernment.in)

Video Analytics at the Edge – Safe City

To run the city surveillance operation in a live environment the surveillance solution has to run the analytics at the edge and near to where incidents are actually happening. For the same the technology at the edge has to support the parallel processing of the surveillance data and run the analytics with the correlation of data from different sources to generate the alerts and notifications with the right standard operating procedures defined of the city.

Benefits of running Analytics at the edge

- Authorities will be able to trace, monitor and act without delay in a live city ecosystem.
- Saving of resources from edge to the centralize site.
- Decision making will be fast.
- Enable location base analytics and services.

Conclusion

The approach mentioned in the paper help and transform the city governance to the next level and in the same time will bring the efficiency and contribute towards the good governance to the eco system.

This approach will also enable the city operation on the following key areas

- Managing operations of the municipalities and cities in a live environment.
- New revenue streams when launching new service offerings for consumers, industries, and municipalities.
- Faster time-to-value with accelerated deployment from solution vendor's devices and applications.

City surveillance isn't just about installing cameras. To analyze feeds and flag incidents in real time, edge analytics can be invaluable (Pic: pexels)

- Flexibility of options, including cloud-based offerings.
- Mitigated risk

By embracing new capabilities, services, and solutions, municipalities and authorities alike can deliver a standardized end-to-end platform, create new services in the industries of their B2B/B2C/B2B2C customers, and derive new value from data.

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Emerging Technologies

Blockchain for Governance

It can minimize error and fraud while driving efficiency—without relying on external trust agents

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Blockchain for Governance

It can minimize error and fraud while ramping up efficiency and productivity--without relying on external trust agents

The government sector is a complex machine involving multiple internal and external stakeholders. It is accountable for good governance, with complete transparency; despite centralized governance rules and fragmented data sharing and delivery structures.

A truly transparent, open and enforceable public setup would empower citizens, businesses and government departments to interact with lower risk of disputes or exploitation. Existing technologies provide part of the solution, but the important benefits are lost if the parties continue to audit and re-audit each transaction against any dispute.

Blockchain is an emerging technology that can help address some of these inefficiencies. Blockchain can provide an undisputable ledger for any government-licensed asset or citizens or business-owned intellectual property (physical or digital) – such as land, vehicles, loans, identity and patents.

Double-selling of such assets always poses concerns. Digital assets are much more prone to counterfeiting and replication. Blockchain can help bring better access control over such assets. Using blockchain technology, ordinary contracts can be embedded in some digitized code, which can be stored in transparent, shared databases so that they are protected from deletion, tampering, and revision.

In all cases, blockchain can minimize fraud and error while delivering substantial benefits in terms of efficiency and productivity.

A Distributed Database

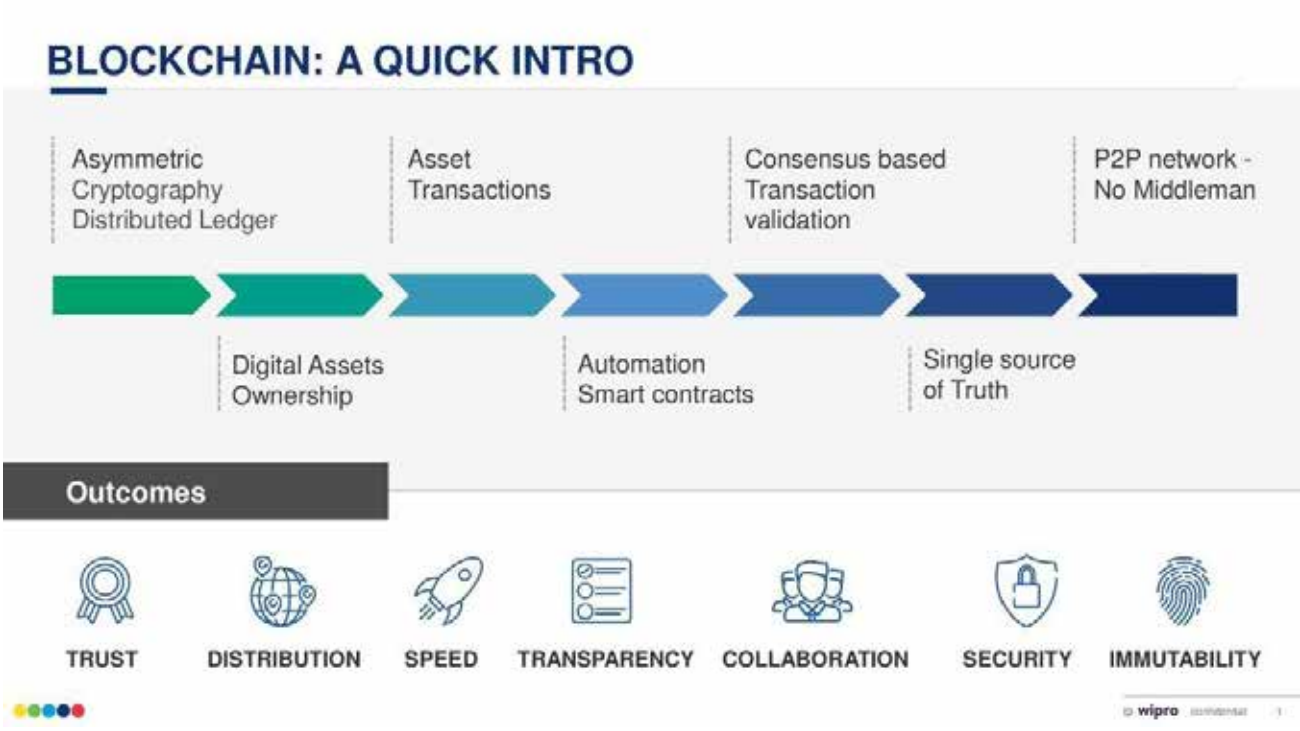
At the very heart of it, blockchain technology is nothing but a database that is distributed across a network of computers. The database holds a time stamped copy of every transaction, digitally signed by the transaction initiator and secured through consensus algorithms. These algorithms keep the database secure so no single party can change the record and anyone who changes can be tracked based on digital signature and thus can act as a single source of truth.

In short, each computer within the network holds the exact same copy of the database, is individually secured through advanced cryptography, and is used to validate the other copies of the database across the network against any corruptions. Since it is distributed and secured, it eliminates a need for any central authority or intermediary. Any dispute within the network are resolved collectively by the network itself. The result is a pure peer-to-peer network of secure and trusted transactions. It can be used to transact anything of value. Blockchain is a true representation of democracy and collaboration.

A key point to remember is that Bitcoin (or any other cryptocurrency) is not blockchain. Bitcoin is just one of the initial manifestations of blockchain. The wide-spread adoption of cryptocurrencies is just to be treated as one of the earliest proofs of the underlying blockchain's endurance and capabilities to showcase the possibility of smooth collaboration across multiple known or unknown entities without a need for any intermediary. Now, as the technology is evolving, the dimensions of blockchain applications are seen to go way beyond just Bitcoin.

Public Sector

With an ever-growing popularity of blockchain, the discussion has evolved from why to use blockchain to how to use blockchain. The government sector is not behind and has seen some really remarkable blockchain use cases. Whether to regulate the export-import custom duty or to securely manage the digital identity of



Blockchain uses a decentralized database. It allows a 'single source of truth', providing an undisputable ledger for any government-licensed asset — land, vehicles, loans, identity and patents.

an entity. All of these assets require significant efforts to adequately govern and monitor the process. Blockchain can help elevate these administrative efforts.

The government services are categorized as follows:

- *Government to Citizens (G2C)*
- *Government to Business (G2B)*
- *Government to Government (G2G)*

This segregation is focused on the major stakeholder impacted in any case – be it be the citizens or businesses or even across various government departments; and does not imply lack of any other collaboration across entities.

> "Blockchain can provide an undisputable ledger for any government-licensed asset or citizen- or business-owned intellectual property, physical or digital – such as land, vehicles, loans, identity and patents"

Each of these segments has its own specific challenges and need to be accordingly addressed.

Blockchain in e-Governance: G2C

The foremost responsibility of any government body is towards its citizens and their wellbeing. Government has several programs towards the betterment of its citizens. However, the absence of clear visibility to these programs, or clear insights to the parties or work-flow involved to enable such programs are typical operational challenges. Blockchain can bring a lot of clarity and enrich user experience here. It can bring all involved participants onto a common platform, enable stronger status checkpoints and keep everyone accountable to their actions.

Example: Micro-lending through Smart Contracts In an Indian state, one of the key tasks is to establish credit-worthiness for poor villagers as they generally don't have access to cheaper loans. Traditional bank loans are not a viable option for them, as villagers generally do not have a digital footprint to allow for any credit rating. Such small loans also attract higher administration and processing cost. Lack of such

credit worthiness leads to unaffordable higher rates of interest.

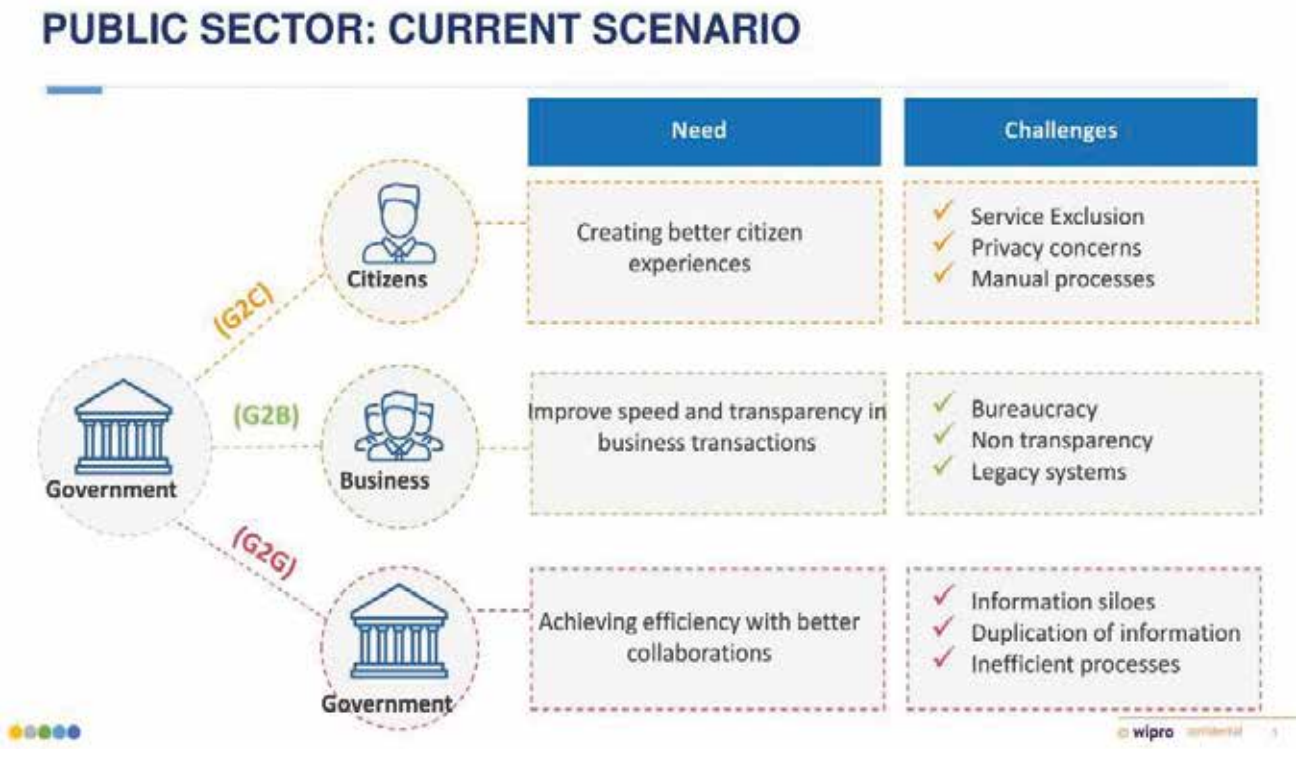
To address this concern, we have undertaken a project to provide a blockchain-enabled micro-lending platform. The state government is supporting these micro-lending initiatives at a cheaper rate through the local village merchants. The villagers reach out to these merchants to seek some small loan. The merchant has an access to a micro-lending mobile application through which he or she can check the villager's reputation on the system – if any – through their Aadhaar identity.

The blockchain enabled application keeps a track of all such loans dispersed and recovered. The merchants are incentivized through certain percentage of interest components paid by villagers. All the payments and reputations are managed automatically through "smart contracts". The application is designed such that over the period of time, a strong digital footprint for both the villagers and the merchant is established to enable any future loans through the traditional channels.

Example: Managing Land Registry Land is one of most sought-after and hence most notorious for foul play. Property disputes are also the most difficult to resolve as well. It is estimated that the pending legal cases related to land fraud alone comprises of almost one third of all the legal cases in India. Any means to ease the burden of proper geo-fencing of a property and then assigning true undisputed ownership to it holds immense value to a lot of entities.

Several state governments are venturing to address this challenge through blockchain, in partnership with Wipro. The geo-fencing of a given plot of land is done through use of specialized drones which not only do a 2D mapping, but a 3D image of the entire space.

This data capture is time stamped and recorded onto the blockchain. This set of data is then further enhanced with the encumbrance and other existing paper-based ownership certificates. Once this data is digitalized, the next step is to assign new-age identity management forms such as Aadhaar or GST (goods & service tax) numbers to accurately track the property against



Blockchain can enhance service experience wherever there is an interaction – G2C, G2B or G2G – which needs trust and transparency as key elements

the other departments such as revenue and tax departments or to resolve any disputes in the legal department.

Currently the project is hosting the land registry data on blockchain as a single source of truth which is to be used by over 18 government bodies. The next step in this project is to open the access (for a fee) to the common public as well to establish any land record credibility, sell a property, buy a property, pay taxes get sales deed, get new ownership certificate – all from a single place. Since the platform is already linked to all the relevant government departments, the process of buying and selling a property becomes so much easier.

Government to Business (G2B)

Businesses are the key revenue sources for the government. Government is always trying to establish and empower their businesses. The more the businesses flourish, the more the people are employed, and the more the general standard of living improves. The country's economy, the infrastructure, the trade all are inter-linked. These are also indirectly feeding into the different taxes and ensures that the country as a whole grows.

However, the G2B channel has its own set of challenges. The lack of visibility to do business or to slow the speed hinders the entire process. It is such friction which needs to be addressed if we want to see our businesses grow and rise. We are briefly discussing few scenarios where blockchain can help bring great visibility and transparency to address the challenges. This will also hold the businesses accountable to their actions and help automate and smooth out legacy procedures.

Example: Import and Export Customs This is a representative scenario for any supply chain visibility requirement. A strong hold on the supply chain is of immense importance to any business. It can be easily related to any perishable goods where a delay at any juncture can mean huge losses for the business.

Traditionally, customs ports have been regarded as a 'black box' with great uncertainty of the clearance time. The shipments may get cleared within a day or even after a month. Now, as a government department, customs plays a strong role here. Its job is to ensure that any illicit material does not get past the security checks. While in its pursuit for security, the local businesses should not get adversely impacted.

> "If double-selling of assets is a concern, digital assets are even more prone to counterfeiting and replication. Blockchain can help bring better access control over such assets. Ordinary contracts can be embedded in digitized code, which can be stored in transparent, shared databases so that they are protected from deletion, tampering, and revision."

Blockchain is brought in to bring in this fine balance. We are working with customs authorities to enrich their existing applications to allow a more seamless and yet secure platform to enable the tracking and status of any consignment across their ports. The application brings in the exporters, courier agents, logistics providers, warehouse agents, custom officials and the importers onto a common platform.

By using this platform, customs is making their service business friendly by opening up their application to allow the status of their consignment be checked while it is routed through the customs. Such a display of openness and transparency enhances the department's reputation while making businesses truly understand the custom's challenges and enhancing their system for a more streamlined process flow.

Example: The GST GST has revolutionized the way taxes are calculated in India. This new single tax rule greatly simplifies the process – in theory. It was practically observed that when the GST was implemented, the first 3-6 months, none of the tax credits could get processed – due to the challenges in accurately identifying the taxable amount.

Per GST – the final taxes are to be paid by the end consumer. Any of the interim taxes paid by the retailers, manufacturers, or logistics agents, or OEMs (original equipment manufacturers) or raw material providers can get refunded back to them. In short, all the taxes across the business value chain (other than the final end consumer) should be in sum zero. The only tax to be assessed should be on the unspent amount paid by the end consumer. It is fascinating how blockchain network is based on the exact same setup. The sum total of the assets on the blockchain network is also zero which can be the same representation of all the transactions within the business supply chain. All the amount which is left outstanding is eligible for taxation.

The core blockchain algorithm itself will ease out the process of calculating and managing the GST calculation and help ease the entire process for both the government and all the parties involved in the transaction i.e. reducing the efforts for reconciliation.

G2G: Government to Government

It would be almost impossible to imagine any government process working in silo. Every government procedure has a heavy dependency on several others to provide the due output. With such heavy dependencies across multiple entities, there are bound to be communication and interaction challenges which again brings great inefficiencies across the system.

Blockchain, with its ability to manage interactions and coordination across multiple entities attributing responsibility due to the digital signatures, comes to our rescue. The best part of blockchain, as compared to any other technology, is that its value increases with the increase in the number of parties involved.

Micro-lending: Blockchain powers a micro-lending mobile app through which a merchant can check a villager's reputation on the system using Aadhaar authentication (Pic: Pexels, Photographed by Rewat Wannasuk)

Blockchain allows Customs to make its service business friendly by opening up their application to allow the status of their consignment to be checked in real time, allowing openness and transparency. (Pic: Pexels)

Example: StreetBump – Detecting Road Potholes The city of Boston has a smartphone application called StreetBump. This app. has been developed to help the city of Boston better manage its resources. The app. draws on the accelerometer and GPS (global positioning system) data to help passively detect potholes on the Boston roads, instantly reporting it to the city officials. What this app. has in turn done is that it eliminates the need for any road inspector to go and manually check the condition of the roads. Furthermore, this approach is more proactive and aims to yield better citizen services.

The outcome of this app. at Boston is a different question altogether. Imagine what such app. could do to manage the Indian roads. How about using the data from sensors on buses or public transports (instead of cars or smartphones). Today, vehicles are getting sensors to show the accurate GPS location of their vehicles. We can use the same accelerometers on these sensors to capture data on blockchain. These data points will get averaged out over the period of time and routes, and will provide immutable proof of the condition of the roads to the road authorities.

By treating the patches of roads as assets on blockchain, and having the different public and private entities as stake holders, we can ensure the conditions of the roads are always good. The road construction contractors will get paid say 80% of their services immediately on work completion, while the rest of 20% is delayed over the period of 6-8 months and is automatically

> “The value of blockchain increases with an increase in the number of users or parties involved Blockchain helps manage interactions and co-ordination across multiple entities, attributing responsibility via digital signatures in encrypted blocks”

and undeniably validated by the public through these smart sensors. Even the coordination of the payment for a road construction can be shared between different government departments. If say a water department agents digs up a road, such entities can easily be identified in a proactive manner and be charged for the repairs accordingly.

Permission Accordance and Monitoring of Tree Felling Did you know that in order to cut any tree, be it even in your own backyard requires a permission from the forest department! It requires their approval, and then a few others from a variety of different departments such as the electricity department, the road and transports authority, the land registry department and the revenue department.

This was part of a challenge that was posted on a state sponsored blockchain hackathon. The interesting part of this exercise was to address the huge amount of collaboration required between these departments. The person who intends to cut a tree needs the permission from the forest department to confirm the ownership of the tree itself. The tree has to match the tree consensus. Next, the land registry needs to establish the ownership of the land to allow you to cut that tree. Next the RTA (road and transport authority) needs to provide approval to carry the cut tree through the specified and approved vehicles. The saw mill needs a permission from the electricity board before it can process the tree into logs. The subsequent logs produced also need permission from the revenue department to accept that the amount matches up.

Such a task takes a typical time of over 3-6 months to get the needed approvals. With such enormous level of approvals and validations, we can easily envision blockchain streamlining this entire transaction while providing clear status checkpoints to the end users. Even the approval processes across the government departments can become so much easier with such complete tractability of the entire work flow.

The blockchain network has a close affinity with GST, where all the taxes across the value chain should be in sum zero, barring the tax to be paid by the end consumer. A blockchain algorithm will help better manage GST. (Pic: Pexels)

New Blockchain Beginnings

We have showcased a host of ways for enabling honest electronic transactions without relying on external trust agents. Blockchain technology helps us embark on the journey to a peer-to-peer network using proof-of-work to record a public history of immutable transactions. This enables better governance than was ever before possible, building a blockchain-powered path to sustainable, collaborative and effective models of governance.

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21st National Conference on e-Governance

Building User Experience

Artificial Intelligence for Good

AI has immense power and potential. How can we ensure that AI is reliable, safe, trustworthy, and fair—and what is the role governments should play?

Developed by

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AI to Augment Human Ingenuity

Thimi is a tiny village in Nepal wherein most of the people subsist on marginal lands, relying on livestock to earn a living. Rajesh Ghimire and his wife, Sharadha, are one such family who worked hard to build up a modest herd of 45 cows, goats and buffaloes. About seven years ago, a heat wave struck the region, triggering an outbreak of anthrax among their animals. About half dies. Rajesh and Sharadha are still trying to recover economically.

Recently, their 20-year old niece, Melisha, saw an opportunity: she and her friends developed a mobile application that uses artificial intelligence (AI) to notify village farmers, like her aunt and uncle, when their animals face a health risk. (Melisha's work was especially impressive as very few girls study science in Nepal and very few women work in tech.) The app. analyzes real time information from the sensors that are strapped on the animals to monitor their vital signs and activities (such as temperature and step count). Although the project is still in its infancy, the app. has already helped identify anthrax in one cow, early enough to prevent a wider outbreak on a farm.

This is an example of our vision for AI: to amplify human ingenuity with intelligent technology, a "human-centered" vision of AI—where human intelligence is augmented through advances in computer vision, speech recognition, natural language processing, and machine learning. AI developed in this manner can help people to achieve more in nearly any field of human endeavor.

AI—Empowering the Future

In general, AI refers to a set of technologies that performs perception, learning, reasoning and decision-making, aimed at endowing machines with intelligence that can be used to solve complex and challenging problems. Its development is at an inflection point, where the vast amounts of data available, combined with affordable computing power in the cloud, have facilitated great advances in innovative algorithms in the last 15 years. AI promises that the knowledge gained from applying analytics and machine learning to the data available will enhance any decision-making process with additional insights and intelligence, leading to better outcomes and improving every aspect of people's lives and economic activity.

AI technology available today can already save thousands of lives and improve performance of numerous systems. Key opportunities include healthcare, transportation, education, agriculture, manufacturing, and accessibility for those with special needs. In India, we are applying AI in various spheres - from predicting crop yields, pest risk prediction, sowing patterns to price discovery. Furthermore, similar algorithms are being applied to predict visual impairment in children as well as predicting school dropout. AI can also enhance the resilience and capacity of critical infrastructure, including the electrical power grid and road network.

In healthcare, AI can reduce hospital readmission, enhance the quality of care for managing chronic disorders, and keep hospitals safe and efficient. An Institute of Medicine study released in May 2016 estimated that preventable errors in hospitals are the third leading cause of death in the US, trailing only heart disease and cancer. The number of deaths is estimated to exceed 250,000 patients per year. AI systems can be developed to catch errors by recognizing anomalies in best clinical practices, thus, saving thousands of patients per year.

AI needs access to vast and diverse data sets in order to train algorithms

AI can also enable new approaches to existing challenges such as cancer research. Microsoft researchers are collaborating with biologists, radiologists, and other medical experts to pioneer new genetic approaches to identify how a disease is progressing and how to provide personalized treatment. In essence, existing information is used to debug the biological system, transforming the data into knowledge by developing computational models for the processes in our bodies.

Despite its potential, there are also many concerns about AI, including the economic disruptions that may come with fast-paced automation, the displacement of various kinds of jobs, and the development of technologies that can amplify and further entrench biases that already exist in society.

> "AI refers to a set of technologies that performs perception, learning, reasoning and decision-making, aimed at endowing machines with intelligence that can be used to solve complex and challenging problems"

Our vision for AI is one where machines and humans work together to enable greater societal progress and equality, and where AI is made available to everyone (through our cloud services) to empower every person and organization. This is a "human-centered" vision of AI – a future where machines augment and extend human abilities and experiences, empowering every individual to realize their full potential, and enabling new socio-economic opportunities.

As more and more technologies are playing a substantial role in mediating people's lives online and offline, it is essential that appropriate design, economic and social choices be made to ensure that these technologies are deemed trustworthy by individuals and society at large – be regarded as respectful and inclusive, helping society to progress by empowering all individuals and organizations. The computational power and learning capabilities of machines must be coupled with the sensitivity and emotional intelligence of humans. Simply put, technologies need to be people-centered by design.

This humanistic approach to AI can be realized if relevant stakeholders from business, government, civil society and the research community collaborate on shared principles and ethical frameworks. These can be defined as below:

Technologies should

1. be designed to assist humanity
2. be transparent
3. maximize efficiencies without destroying the dignity of people
4. be designed for privacy
5. have algorithmic accountability so that humans can undo unintended harm
6. guard against bias

Complementing the above are considerations for everyone who is developing, deploying and using these technologies:

1. Empathy
2. Education (knowledge and skills)
3. Creativity
4. Judgment and accountability

A common vision, with shared principles, will enable all stakeholders involved to shape the future of AI and realize a universally desired future.

Realizing the full potential of AI will require collaboration with partners in industry, civil society and the research community to shape a future in which AI and people are working together, developing the appropriate technologies, products and policy frameworks that can realize this vision. Keeping the above framework in mind here are the optimal direction that can be looked at on key policy issues with respect to AI.

AI—Innovation vs Regulation

The Issue: Should governments start developing regulations on AI to address many of the challenges that are posed?

AI is at a nascent stage of development, and governments should prioritize the desire to innovate rather than to regulate. Broad regulation of AI technologies would be inadvisable at this time; instead, its continued research

“AI is at a nascent stage of development, and governments should prioritize the desire to innovate rather than to regulate.”

and development, as well as innovation on AI technologies across all sectors, should be encouraged.

The above is expressed concisely by President Obama : *“The government should add a relatively light touch, investing heavily in research and making sure there’s a conversation between basic research and applied research. As technologies emerge and mature, then figuring out how they get incorporated into existing regulatory structures becomes a tougher problem, and the government needs to be involved a little bit more. Not always to force the new technology into the square pegs that exists but to make sure the regulations reflect a broad base set of values. Otherwise, we may find that it’s disadvantaging certain people or certain groups.”*

Access to Data

The Issue: What regulatory changes are needed to enable AI access to data?

AI needs access to vast and diverse data sets in order to train algorithms. Existing data-access laws, including privacy, copyright, open government data and antitrust data access, may need to be updated to help enable the benefits of AI. For example, governments should weigh privacy interests against the benefits of AI insights based on access to data. Although copyright laws should protect the expressive value of a work, they should not restrict the analysis of creative works to extract data that can lead to useful AI insights in ways that do not compete with copyright owners.

Reliability, Resilience, and Safety

The Issue: Why are reliability, resiliency and safety essential to widespread deployment of AI systems?

AI applications should be augmented with human judgements in sensitive situations where marginalized groups that may not be well represented in large data samples are involved

People must feel that AI systems are trustworthy if they are to use them widely. These systems need to demonstrate that they can be depended upon to make appropriate recommendations in as many circumstances as possible. Designing appropriate AI behavior in a very broad set of circumstances raises many challenging issues that are actively being researched.

Regarding reliability, as AI systems learn by detecting patterns in the input data, lack of sufficiently diverse data points, or failure to include additional relevant data sets, may lead the system to learn incorrectly. For example, a facial recognition algorithm that is trained on photos of primarily Caucasian faces will not work as well with other races. Such issues have a higher chance of being spotted if data scientists are working alongside sociologists and those with expertise (e.g., doctors, farmers) in the topic to which AI is being applied, but additional research is required on how to detect them.

Research is also needed to minimize any unintended consequences of actions taken by AI systems in all situations, but especially in those where the systems need to make decisions with incomplete information. Techniques are needed to validate and verify that the systems are behaving as intended. Until this is possible, human oversight and/or intervention in the execution and deployment of AI systems is often suggested.

Fairness and Discrimination

The Issue: Will AI systems make recommendations that may be deemed unfair or discriminatory?

A number of recent articles have demonstrated how AI recommendations can have significant social and economic implications. For example, lenders assess borrowers' creditworthiness by checking their friends' credit scores. In other cases, AI can expose inherent societal biases. For example, men are shown advertisements for career-coaching services for high-paying jobs far more frequently than women; a study showed that risk assessment software used by criminal justice systems across the USA to identity potential future criminals is biased against African Americans.

Fairness issues can arise due to training of algorithms based on data sets that are incomplete, or data that reflect existing societal and cultural biases. However, people's expectations are that technologies are neutral, and have greater certainty and accuracy than human judgments. As such, there is a tendency to bestow these systems

> "Governments should weigh privacy interests against the benefits of AI insights based on access to data."

with more authority than they deserve. For example, a credit-rating algorithm that suggests a person has an 80% probability of being a credit risk is also suggesting that, in 20% of the cases, someone with similar characteristics is not a risk. Nevertheless, a loan officer is likely to deny a loan to everyone who is tagged with the 80% probability of being a credit risk. Limitations of these systems should be recognized, and their application augmented with human judgements in sensitive situations such as those involving credit scores, personal finance, employment and health care, especially when marginalized groups that may not be well represented in large data samples are involved.

Active research is ongoing to detect where use of AI may lead to fairness issues, including how to quantify fairness, and how human-AI collaboration can effectively help address issues with transparency and interpretability of systems, which can lead to better accountability. Indeed, it may be that AI systems can point out where societal and cultural biases are being perpetuated.

As technology increasingly mediates how people interact with everything and everyone around them, AI systems need to be trustworthy. A more humanistic approach needs to be applied to AI in-order to benefit people and society, thus, enabling AI for good.

Privacy

The Issue: Does AI exacerbate existing privacy concerns that already exist with the use of big data?

AI systems that concern people will need data about people to function. Predictions about who is most likely to have a second heart attack cannot be made unless access is gained to a large amount of data about a wide variety of people who have had a first heart attack. In order to gain access to that data and the right to use it, AI systems need to earn user trust. People won't share their data if they don't believe it will be used safely and securely and to a good end.

As such, it is essential that the basic privacy principle are also applied to AI systems. The four key principles that are worth pointing out include:

- Putting people in control of how their data are collected and used
- Transparency of AI systems (within limits, as transparency may be challenging in various ways)
- Strong security of people's data
- AI techniques should be used to benefit people

Humanized AI – a future where machines augment human abilities, empowering every individual to realize their full potential, and enabling new socio-economic opportunities

However, privacy laws may also need to be adapted to realize the benefits of AI. Collection of data about people should not be treated as inherently problematic when indeed the data are applied to increase human understanding about our world and enable the use of AI for social good. Data collected for one purpose may yield great insights when analyzed for other purposes. For example, use of AI to augment and enrich the world for the visually impaired; develop a patient-centric health-care approach that can help reduce medical errors and new approaches to criminal justice, including reducing bias in arrests, prosecution, sentencing and diverting those in need of medical care away from incarceration.

Anonymization techniques should be strengthened. While perfect anonymization techniques may be theoretically unattainable, they can go a long way toward reducing the risk of a bad actor successfully discovering information about particular people from a data set.

Liability

The Issue: What is the framework for determining liability when AI systems take decisions with negatives consequences (e.g., unlawful behavior, people being harmed)?

Liability is most often raised in the context of autonomous vehicles, and also in the broader dialogue on intermediary liability for platform companies. This can happen if the system receives input that was unexpected, if it learned based on erroneous or incomplete data, or if it continues to learn and evolve in unexpected ways based on customer data. The issue can be further complicated if the consequence results from autonomous interactions between different AI systems.

> “As technology increasingly mediates how people interact with everything and everyone around them, AI systems need to be trustworthy.”

Determining responsibilities and associated liabilities in connection with the use of AI is an area that will need further consideration and will likely need to be re-examined over time as the technology evolves. At this point, policy makers should avoid strict liability regimes, as these may deter the development of and investment in these promising technologies. At the same time, development of trustworthy AI systems should be encouraged.

Standards

The Issue: Are there efforts to standardize aspects of AI that can be integrated into an AI policy framework?

Standard efforts on aspects of AI can contribute positively to policy discussions in clarifying some of the concerns expressed. For example, standards can specify a definition for fairness, or certification procedures for AI systems. The recently launched IEEE Standards Project P7000 “Model Process for Addressing Ethical Concerns During System Design” that is part of its broader ‘Global Initiative for Ethical Considerations in the Design of Autonomous Systems’ is an example of such an effort. Standards organization such as STUC can also coordinate development of testbeds for AI systems or development of data sets for training these systems.

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21st National Conference on e-Governance

Building User Experience

UX and Public Services

Modern government services need to move beyond purely functional issues, to meeting citizen expectations of user experience

Developed by

In collaboration with

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UX and Public Services

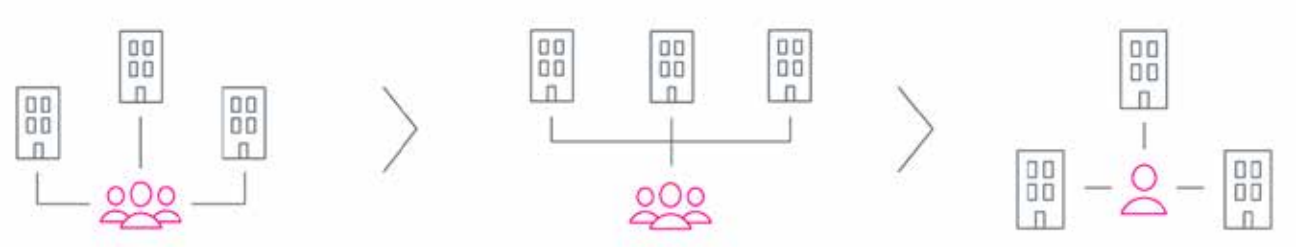
Modern government services need to move beyond purely functional issues, to meeting citizen expectations of user experience and ensuring that the benefits of government services are more easily accessed

Introduction

In recent years, there has been a seismic shift in how public services are delivered, with more and more services moving online. Digital has fast become the new normal and it is inconceivable that government strategies for future service delivery would not have digital services as the front door for most queries and transactions.

To date, delivery of digital public services has focused largely on functional issues such as online access, security, identity, and the choice between open source or closed platforms. These are important building blocks and enablers for citizens to access digital public services, however, governments now need to look beyond addressing functional requirements to provide online services that matter most to citizens to build trust, improve efficiencies, reduce costs, and ensure that the benefits of government services are more easily accessed.

Evolution of Digital Government



Departments.gov

Early sites are online noticeboards, making government more visible but not necessarily accessible. The offer is fragmented and based on internal organizational structure, not user needs. There are few online interactions or transactions.

Services.gov

Governments aim to provide a single-entry point to access digital services, cutting across departmental silos with a more coherent citizen centric offer. Online interaction is increasingly provided for common or expensive transactions. Agile project management techniques, deep user research and iterative user testing are common.

Me.gov

Digital journeys begin and end in the real world, moving seamlessly between government channels and search, social media, advertising, email, CRM and apps. Design is driven by deeper, broader insight into how users feel about their service experiences and how that drives outcomes. Agile iteration supported by machine learning continuously improves algorithms that underpin digital experiences.

Globally, most governments are in services.gov stage, which is characterized by the provision of single entry points and the reduction of departmental silos, where online interaction is increasingly available for high-value or high-volume transactions. But this stage does not yet fulfill the third stage of transformation, me.gov, which envisages seamless, fulfilling and citizen-centric online services.

It is at the me.gov stage of transformation that governments truly realize cost efficiencies and improvements to social and policy outcomes, and generate a level of engagement with citizens that helps support a virtuous circle of prosperity and stability.

1. Citizen Journey

The online process is seamless, efficient and complete

2. Mobile

Optimized and responsive across smartphones, tablets, and desktops.

3. Design

Graphics, visuals, and content are usable and easy to navigate.

4. Relevance

Content and functionality tailored to meet the needs of the specific individual or group.

5. Relationship

The experience creates a relationship between the citizen and the provider.

Taken together, high performance across these dimensions (see figure) captures the seamless, tailored and fulfilling experience that citizens increasingly expect from and demand of both private and public sector online services.

Governments are performing better on the delivery of the more functional components of experience – citizen journey and mobile. These components are more broadly associated with infrastructure, IT, and the basic foundations of digital delivery. By contrast, governments are not yet meeting citizen expectations in the more advanced and emotive components of experience – Relationship and Relevance. When delivered well, these components help build the strongest and most meaningful connections between government services and citizens, because they demonstrate to the user that their needs, preferences and views have been considered.

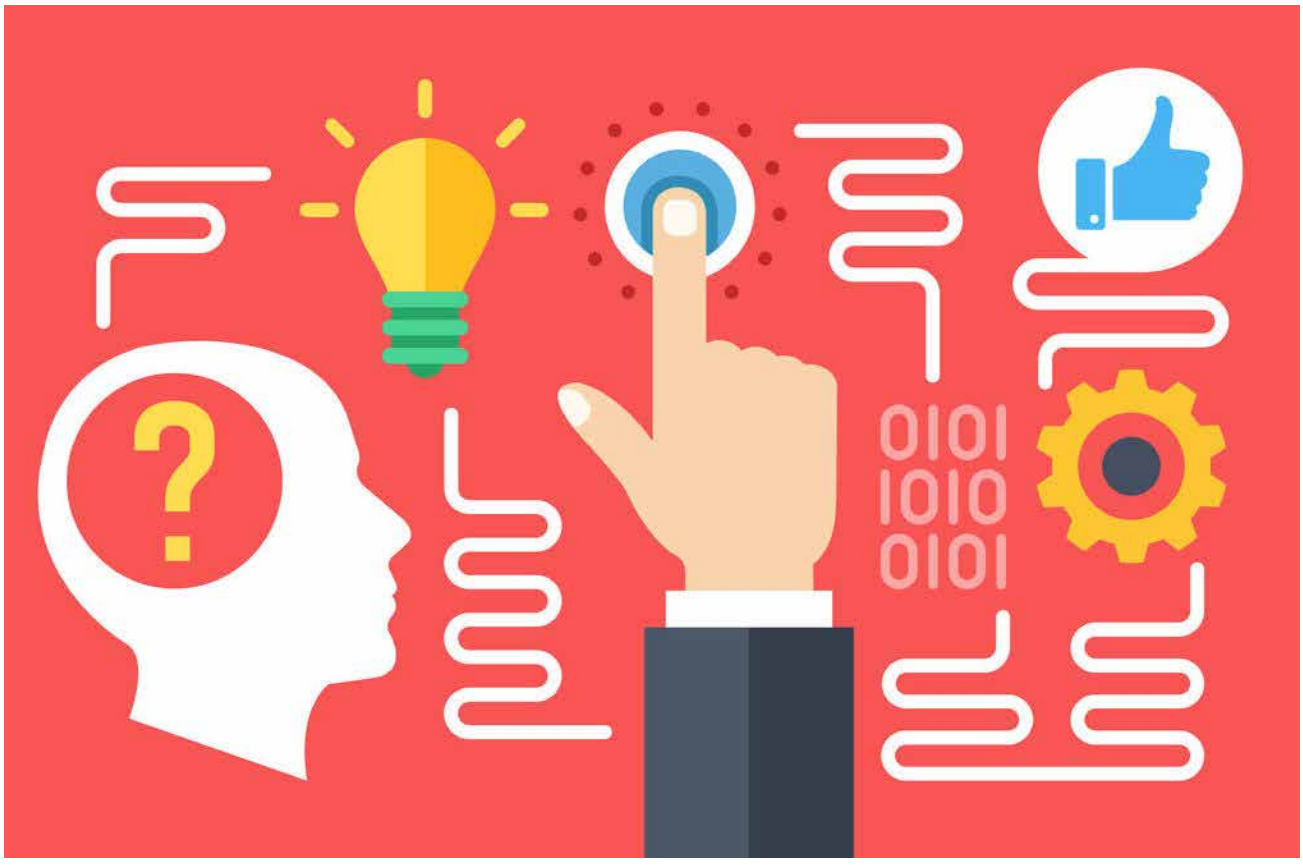
Relationship and Relevance are not dimensions traditionally prioritized by governments when attempting digital transformation. Therefore, these areas must be prioritized if governments are to provide services that are future-proof and aligned with what citizens increasingly expect and need.

The Citizen Journey Dimension

The start of the online citizen journey is the point at which the citizen is ready to engage with the government and ends when their needs have been fulfilled.

Indicators and insights

An ideal citizen journey is a seamless end-to-end experience; across channels and over time, the experience of seeking information, completing a task, or a combination of both, is consistent and



(Pic: 123rf © Yulia Kireeva)

coherent. In a positive citizen journey, the entire process can be completed online, and there is support available where necessary to overcome any potential obstacles.

Globally, the most important feature for improving citizen digital experience could be the ability to save and continue later. The desire for this functionality is particularly required in services that involve submitting information forms such as passport application, government benefit services and personal tax services, where citizens desire for pre-filled documents to facilitate the process. This element of the citizen journey can be seen to align with relevance, which identifies the importance of personalized, tailored services in facilitating a positive experience.

> "We hear of UX more for commercial applications; yet, in user experience is crucial e-governance: to improve efficiencies, reduce costs, and ensure that the benefits of government services are universally and easily accessed"

The citizens' need for reassurance and the human touch is also very strong. The perceived loss of human guidance or reassurance while navigating complex systems can be a huge reason why citizens drop out of an online journey.

Features that enable people to seek guidance in the moment – such as integrated chat support that detects what page people are on – are a crucial next step in the evolution of the online government experience. Such measures ensure that more people can complete transactions via one channel, reinforcing efficiency and building a stronger relationship with government. This aligns with and reinforces the importance of relationship, which recognizes the value that citizens place on having a mechanism for dialog.

Citizen journey : Why it matters

Demonstrate Citizen Understanding
Organizations are still struggling to map touchpoints and understand citizen journeys. This results in journeys shaped by departmental siloes and internal bureaucracy, instead of citizen needs. The ability to put the citizen at the heart of service delivery will be a key driver in reestablishing trust & delivering services that fulfill their potential to drive social & financial benefits.

Time Efficiency
A quick and efficient citizen journey is one of the most straightforward ways of demonstrating the value of digital transformation. A clear improvement in the value equation (time spent versus outcome) could act as a powerful driver for uptake of online public-sector services, where one of the most common negative attitudes expressed is slowness.

Citizen Empowerment
Online services must empower citizens to complete processes online. As frustrating as long queues are, for many services and situations citizens will continue to prefer face to face service if they cannot easily complete a process online.

Proactivity
Citizens' experiences start long before they reach a government website, so the optimal journey should react to citizens' signals of intent (e.g. search, social media) to funnel them towards the solutions that meet their needs, and then guide them through the experience.

Building a long-term Relationship
Citizens interact with public services over the long-term, not merely in one-off transactions. Customer Relationship Management (CRM) tools can be applied to public services to predict which additional services or information may be useful and proactively offer them to citizens to create deeper engagement.

Risk of Exclusion
A poorly formulated citizen journey can also become imbued with political meaning. An inefficient citizen journey – in applying for benefits or citizenship, for example - can be viewed as purposeful, consequently creating or reinforcing barriers between the citizen and the establishment.

Digital incentives can help, but UX drives adoption. Unless digital payment is as convenient and reliable as cash, millions of users won't easily make the switch

The Mobile Dimension

This dimension relates to the use of smartphones and tablets, and whether a specific service is optimized and responsive on and across these devices. This is critical for service accessibility, especially in countries like India where the mobile has the highest penetration.

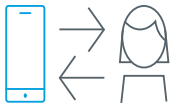
Indicators and insights

Mobile accessibility provides a lens for illustrating the distinction between basic functionality and experience. For most of online services, if it can be accessed on a computer, it can be accessed on a mobile device. This does not, however, consider the distinct experience of using a service on a smartphone and how this might impact usability.

Further questions must be considered: does font size adjust to smaller screen size? Does the page layout adapt between horizontal and vertical? Can I begin on my laptop then complete on my tablet? These questions speak to a stage of "mobile responsiveness," where mobile use is considered and built in from the start.

> "Government services worldwide tend to focus on functional issues such as online access, security, identity, open-source, etc, ahead of user experience"

Mobile :
Why it matters



Keeping up with Digital habits
In India, mobile ownership is higher than laptop or desktop computer ownership. Because governments face an imperative to provide access to all, mobile optimization and responsiveness must be a priority, with a mobile-first design approach considered for all online experiences.

Consistency and Coherence
The ability to move seamlessly between multiple channels is fast becoming a baseline for up-to date online experiences. In the commercial sector, every touchpoint is a manifestation of a brand and must align to the same standards for a consistent user experience. The same will increasingly be expected of governments, as citizens often view the government as one entity, not as siloed departments and organizations.

The Design Dimension

This dimension assesses the way in which the combined elements of graphics, visuals and content impact the successful use of a service.

Indicators and insights

Design accounts for all aesthetic considerations such as font, color scheme, graphics and other visual elements, as well as the organization of elements on the page. A focus on aesthetics should not be dismissed as superficial or simply cosmetic: Design has explicit implications for government objectives. Design can directly impact functionality and accessibility, at times being the decisive factor between a citizen's ability to complete a task online or not. Good digital design can create the same or better emotional response as accessing the service in person.

Presenting services online that are well-signposted, simplified and intuitive are essential to transform frustration with online services into enjoyment of the experience.

Design :
Why it matters

Optimizing behaviors and benefits
Good design can minimize the time needed to complete tasks online, presenting citizens with cues to move through an otherwise complex process. An intuitive layout can facilitate effective decision making and ensure that a journey is completed online.

Sustaining the National narrative
At a time when the world is increasingly engaging with information visually, design can have a significant impact on citizens' relationship and attitudes toward governments. Inconsistent visual identity and ineffective design can reflect poorly on governments' ability to provide services for the 21st Century.

Transparency
In the commercial sector, Design is often used to convey personality and transparency: it is a way of engaging people as partners and advocates. By contrast, bad design can be synonymous with opacity and a lack of concern for the consumer, consequently becoming a cause for distrust.

Adapting to Individual Needs
Use audience research and continuous feedback to iteratively improve the Design of digital government services. Instead of testing to find the single 'best' solution, design teams should use dynamic multivariate testing to find the best solution for each user. Machine learning can help ensure that every user interaction automatically improves the next. Deep user insight, audience research and testing will still play an important role in optimizing

The Relevance Dimension

Relevance is the extent to which an online experience is tailored to the user, either at the individual or group level.

Indicators and insights

Relevance can be achieved in a variety of ways. It often manifests as data-driven personalization like pre-population of forms or targeted, proactive outbound communication, but can also be achieved by providing accessibility options and online support such as webchat.

The provision of a relevant and tailored experience relies on the effective use of data, which remains a point of concern for some in government, either due to internal regulation or to a perceived resistance from the public. Overcoming the former relies on structural progress towards safe and easy data sharing within government, and dedicated resources for management; overcoming the latter requires transparency, engagement and raising citizen awareness about data use.

Relevance :
Why it matters

Shortening attention spans
People are demanding relevance across both the public and private sector. At a time of increasing 'infobesity', attention spans are shortening and consumers are increasingly expecting filtered and personalized content. Information and services that can do so will have a better chance to cut through and engage citizens.

Trust
One of the greatest barriers to adoption of digital services is a pervasive sense amongst citizens that their case is unique. Providing a more relevant experience can increase trust, which is critical for citizens when accessing sensitive government services such as filing tax returns.

Driving and optimizing service usage
Tailoring and adapting content can increase compliance and speed of completion for users, an important added value that can help drive adoption, in turn allowing governments to optimize the service and deliver increasingly more relevant online

Transparency
As government services often involve personal and sensitive data, the onus is on these agencies to communicate why they are collecting certain information, and what the end benefit for the citizen will be of features like form pre-population and suggestion

The Relationship Dimension

This dimension refers to how the experience of using a service affects the relationship between the citizen and the organization.

Indicators and insights

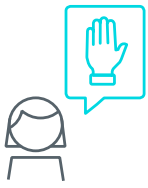
Positive indicators of relationship are enjoyment of service use, and the creation of a meaningful dialog with citizens. Governments can use digital services to deepen levels of engagement with citizens. Applying the principles of me.gov means adopting a brand experience approach to digital public services, taking into consideration the look and feel of digital experiences, as well as tone of voice, interaction and user journeys.

Where relationships are optimized, governments offer a diversity of online experiences to reflect the different types of relationship that citizens want from their public services. For example, citizens expect a different kind of relationship with their tax authority than they have with elderly care services.

Relationship :
Why it matters

Creating a Dialog

While each of the five dimensions feed into the creation of trust and Relationship, what distinguishes this dimension is the focus on dialog. As populations diversify and commercial brands serve up more personalization, the ability to communicate proactively as well as reactively with more tailored messaging becomes increasingly important for Governments. Technology can help services move beyond pure transactions to ensure that users are involved in an ongoing relationship with the service provider.



Trust

Rebuilding Relationships with citizens should be a priority for governments. This will increase goodwill, compliance and engagement, and improve governments' ability to provide effective public services, as well as ultimately leading to better social outcomes. Trust is more important than ever.

Initiating Advocates

A strong Relationship allows governments to foster communities and conversations amongst citizens and create advocates. Using the online experience is an opportunity to engage with citizens, and by proxy to encourage them to engage fellow citizens in conversation about the benefits therein.

A simple, compelling interface and UX was a big driver of smartphone adoption and the current mobile-internet revolution. A compelling UX can help revolutionize digital government services. (Pic: Pexels: pixabay.com CC0)

> Features that enable people to seek guidance in the moment – such as integrated chat support that detects what page people are on – are a crucial next step in the evolution of the online government experience.

Conclusion

Governments are still a long way off providing citizens with the kind of experiences that are commonplace in their interactions with brands and commercial services.

Only through a focus on experience will it be possible for governments to fully realize the benefits of digital transformation: more cost-effective service delivery; greater time efficiencies for citizens; increased accuracy of transactions; improvements in satisfaction; and corresponding benefits in citizens' relationship with the state. Citizens are both individuals and members of communities, with their own identities, needs and preferences. In the future, the ideal experience of a digital public service will be one that intuitively understands and accommodates these needs and preferences, recognizing and respecting the citizen not just as a service user, but as a person.

From the government perspective, providing an enhanced online experience which focuses on relevance and relationship can produce invaluable outcomes by:

UX : Outcomes

Increasing uptake of online government services, driving greater efficiency and benefits for citizens and governments.

Supporting citizens to complete transactions more accurately, reducing errors and avoiding more costly contact.

Reducing the need for offline support, driving greater efficiency and refocusing face-to-face contact on those most in need of additional support.

Increasing optimization, allowing governments to measure and continually adapt services to citizen needs.

Meeting and exceeding expectations, positioning governments as competent to deliver services in the 21st century.

Engaging citizens, providing a widely available interface for dialog and building of trust between the citizen and state.

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