



Changing Technological Trends for E-Governance

Saibal K. Pal

5.1 E-GOVERNANCE TECHNOLOGY TRENDS

There has been successful implementation of National E-Governance Plan (NeGP) in the country. NeGP has been one of the most organized and successful program at both Central level and State level. Many of the Mission Mode Projects (MMPs) launched under NeGP have seen successful. These projects need advancement from various points of view like process re-engineering, need and feasibility analysis, appropriate project planning, and stakeholder's need analysis. The improvement is necessary as technologies are rapidly changing and the new ones like cloud, mobile, grid, and big data are emerging. These new technologies are now making an impact in various cases of E-Governance at the global level.

There is a need in further enhancement of NeGP in the form of "Digital India". E-Governance services are vital for almost all stakeholders, be it user (in rural or urban area) or institutional service provider at government level or private level. Mobile phone-based E-Governance services have been launched in recent past due to large-scale planning of E-Governance projects. M-Health, M-Education and M-Agriculture are some of the successful initiatives by the government using mobile-based E-Governance.

Various E-Governance projects have been launched and implemented by Indian government. In order to encourage future E-Governance projects, the Indian government is promoting technological advancements. The E-Governance projects involve technologies in pipeline such as Ubiquitous

computing, Free and Open Source Software, High Performance Computing, Blockchain Technology and Big Data Analytics. The future E-Governance projects such as Wireless Pollution Monitoring and Evaluation System, and Wireless Sensor Network for Real-Time Landslide Monitoring would use the above-mentioned technologies (Dutta and Devi 2016).

5.1.1 Ubiquitous Computing

Ubiquitous Computing involves mobile computing, distributed computing, sensor networks, context aware computing and location computing. The Department of Electronics and Information Technology (DEITY) is working on ubiquitous computing to generate intelligent products that connect to internet and data generated by it is easily available. CDAC (Hyderabad, Chennai and Bangalore), IIM Kolkata and Amrita University are the ubiquitous computing implementation agencies and academies in India (Dutta and Devi 2016).

5.1.2 Free and Open Source Software (FOSS)

Open source software allows users to modify or enhance the source code. It is available and freely licensed to use, change and share by a person. The National Resource Centre for Free & Open Source Software (NRCFOSS) is the official center to promote and encourage the development of FOSS community. One of the major initiatives of Free and Open Source Software is Bharat Operating System Solutions (BOSS). This system is Linux based that supports 18 Indian languages. Indian Navy, schools in Punjab and E-Governance programs of Chhattisgarh, Kerala, Puducherry, Haryana, Tripura, Tamil Nadu and Andaman and Nicobar Islands have deployed BOSS (Dutta and Devi 2016).

5.1.3 Lean Six Sigma

Lean Six Sigma process is proposed to be used in reform and re-engineering in order to achieve maximum efficiency. Lean Six Sigma process can be used to promote Justice, Transparency, Responsiveness, Equality and Accountability towards needs of the citizens. The use of Six Sigma in E-Governance can improve judicial processes. Lean Six Sigma in E-Governance can also be used in re-engineering Election processes as well as Legislation processes.

5.1.4 *Integrated Single-Window System*

Election Commission of India (ECI) has been working towards preparing an inclusive and integrated system for the election process in India by 2020. It will include various stakeholders of the election process. Election Management Bodies (EMB) all around the world are seriously considering the inclusion of ICT and other technologies in elections at various levels. Different seminars and workshops on technology and elections are considering and discussing the option of E-Voting along with various pros and cons about it. In several countries including India, discussions are underway with various stakeholders and reports are being prepared with different projects and strategies. Different technologies like cloud, mobile, cloud analytics and grid are being used for this process.

With the internet providing a way to integrate the voters and voting process, ECI and EMB are considering the option of online voting as well. Apart from being physically present at the voting center through technology, ECI is also considering the option of voting through the distant mode. Technology will help in enhancing the trust and transparency in the voting process (Press Information Bureau 2016).

5.1.5 *Blockchain Technology*

Blockchain Technology has received a widespread usage in the area of finance like that in managing crypto-currency. Usage of blockchain technology in the area of E-Governance has already started across many nations in the world (Martinovic et al. 2017; Jun 2018). The usage of blockchain technology has resulted in improved transparency, efficient working of the government and decreased complexity of the overall process. Various case studies have been developed related to financial transactions, land records registrations, birth registrations, tax collection, issuing of invoices, pension distribution and the likes. Government of India is also working on including the blockchain technology in their E-Governance framework for better and secured E-Governance services.

5.2 E-GOVERNANCE PLAN FOR NEAR FUTURE

In the past decade, various E-Governance initiatives have been launched. Vision of E-Governance based on global trends has been announced for the next five years for good governance. The vision includes following changes.

5.2.1 *From Assisted Services to Mobile and Digitally Assisted Services*

The increased use of smart phones and penetration of mobile phones and reduction in the cost of data has made it comfortable for the citizens to access government service from anywhere and reduced their travel time and effort to go to government offices or CSC for request of services or to file complaints. This can now be done with ease at homes with the help of mobile phones. Mobile phones are being used as a medium to provide all services, including those that are transactional in nature, on mobile by the government for process transformation and good governance (Fig. 5.1). For Transformational Governance, the combination of JAM (Jan-Dhan, Aadhaar and Mobile) needs to be focused upon and this combination is being implemented for better citizen engagement.

The use of mobile technologies in the national e-Government strategies at this stage is easier for the developing countries as they have just started progressing with respect to the services. Mobile technology helps in providing government services like grievance redressal, status of pending applications, filing tax returns, utility payments etc., and collecting feedback related to the government policies. (Nasscom 2016)

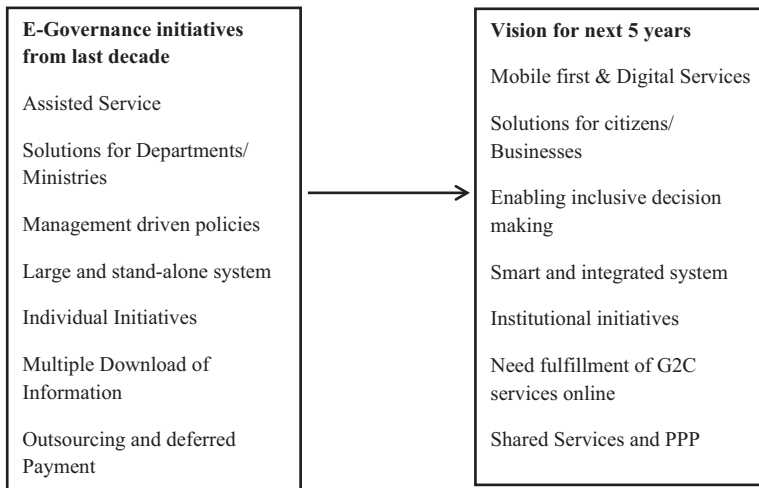


Fig. 5.1 E-Governance vision. (Source: Nasscom 2016)

5.2.2 *From Solutions for Departments/Ministries to Solutions for Citizens/Businesses*

The E-Governance programs generally focus on the digitization of services and processes of departments and ministries to enhance the citizen service quality. But the approach has some gaps such as citizens and businesses are not the center of concern in the approach and the approach limits integration.

The upcoming E-Governance programs are incorporating and integrating the interests of citizens and businesses. They are also converging the government departments digitally to provide better services to the citizens.

5.2.3 *From Management-Driven Policy to Inclusive Decision Making*

The E-Governance policies and initiatives are planned and implemented by the policy makers. However, there is a need for citizens to participate in policy and decision making for a better policy outcome. This can be done through both traditional and social media. Initially, the leaders/managers were responsible for deciding policies, but the role has shifted to involve citizens in helping government to design policies. This change in decision making is reflected in the recent initiatives of the government in the form of MyGov, Mann ki Baat, and so on. Initiatives like RTI, CPGRAM have brought transparency and provided a perfect platform to enable this change. E-Participation should be made compulsory in decision-making policies (Nasscom 2016). Upcoming services will see a lot more inputs from the citizens for better policy making.

5.2.4 *From Large and Stand-Alone Systems to Smart and Integrated Systems*

From large and stand-alone systems in governance, the vision of E-Governance has shifted to smart and interconnected systems such as Cloud, Digital Media, and Mobile Internet. The technological advancement in India has significantly altered the way E-Governance is perceived and carried out and is moving towards Innovative solutions from Collaborative technologies. Adoption of smarter technologies and its alignment with Governance-IT is the next step.

5.2.5 *From Individual Initiatives to Institutional Initiatives*

Change of project leadership and individual orientation in E-Governance Projects often fails. Leadership sponsorship and individual initiatives needs to be separated. Leadership sponsorship strengthens the project while individual initiative makes the project brittle. There is a need to change individual initiatives to institutional initiatives as projects driven by individual initiatives cannot take changes smoothly. A change in project implementation teams results in change in requirements, understanding and scope of the project which hampers the implementation of the project.

5.2.6 *From Multiple Download of Information to Need Fulfillment of G2C Services Online*

Projection and tracking of services online is a complicated task. Rather than citizens and businesses coming to government offices or availing information/services online, the government should reach the needy citizens and provide support rather than people asking government for support (Nasscom 2016).

5.2.7 *Outsourcing and Deferred Payment to Shared Services and PPP*

To bring changes in the current model, there is a need to develop government-wide shared service centers to build capacity and increase efficiency. Partnership with private players will also scale up E-Governance.

India has been renowned as a power house of IT services all around the world and private sector has contributed to this growth. Now, the public sector of India needs to participate in the IT sector and aim Governance Transformation with the help of technology. For this, the government needs to push boundaries, set vision and take actions to incorporate IT in their strategies and decisions (Nasscom 2016).

5.3 PILLARS OF DIGITAL INDIA LEADING TO E-GOVERNANCE VISION

The vision of E-Governance program is threefold:

- Infrastructure as a utility to every citizen
- Governance and services on demand
- Digital empowerment of citizens

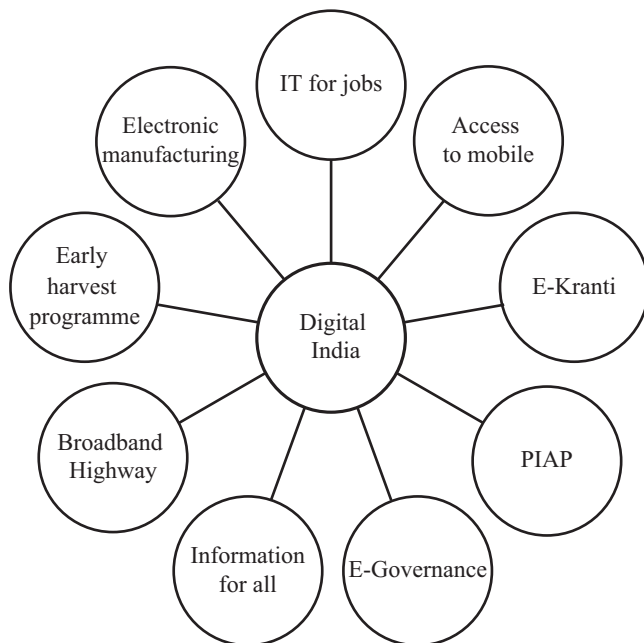


Fig. 5.2 E-Governance vision areas based on nine pillars of Digital India

The Digital India program under the E-Governance schemes in India has defined its nine pillars which forms the major vision areas to work upon (Fig. 5.2).

Initiatives introduced under the Digital India program include E-Sign, Skill India, PMJDY, JAM, E-Hospital, Wi-Fi hotspots, DBT, NOFN, Smart Cities and Digi Locker. These initiatives have been launched to bring a revolution in the governance and to ensure inclusive growth. Some of these initiatives have been successful in their initial phase and their future success is dependent on how policy makers deal with it along with the challenges they face in various stages. Some of these initiatives have been found to be encouraging enough.

5.3.1 *Direct Benefit Transfer (DBT)*

The DBT scheme has been launched to reduce malpractices and to ensure that the subsidies reach the needy people in fair manner. Under this scheme, consumers who are entitled to subsidies will receive subsidies

directly into their bank accounts, while the subsidized goods will be available at market prices. This is done to reduce pilferage, adulteration and other malpractices by the sellers and to ensure that subsidies reach to the needy.

Progress Till July 2015 almost 140 million consumers benefitted from this scheme. The PAHAL initiative launched under this scheme was also successful. Over 1.62 million participated in this initiative and have voluntarily given up LPG subsidy under the “Give It Up” campaign of the government to serve the poor.

Technology Intervention for Success To avoid duplication of beneficiaries and to reduce leakages, it is suggested to link bank accounts with Aadhaar. This will allow efficient tracking and monitoring of benefits transfer.

5.3.2 *JAM Trinity*

The Jan-Dhan-Aadhaar-Mobile is another scheme launched for the benefits of citizens. This scheme proposed provision of three identification numbers to allow citizens to avail several government benefits. This initiative is meant to allow transfer of benefits in a leakage-proof and cashless manner.

Progress The scheme was launched in February 2015. But the implementation of scheme requires the use of Aadhaar. Since this proposal of involving Aadhaar is not quite feasible, the progress on this front is stuck.

Technology Intervention for Success Other identification modes, such as voter IDs that are more common than Aadhaar cards, can be used for authentication and to reduce dependence on Aadhaar cards. This will also help in efficient rollout of the scheme.

5.3.3 *Smart Cities*

Smart cities are cities with high-tech communication capabilities and infrastructure. The government aims to create 100 smart cities by 2022. In Surat, one of the cities selected for transformation as a smart city, a network of CCTV cameras has been set up to monitor crime. The central government has dedicated a sum of Rs. 480 billion for the development of smart cities.

Progress A list of 98 cities has been prepared to be developed as smart cities by the government. Offer for financial assistance has been provided by foreign agencies and development banks such as the World Bank, Asian Development Bank and KfW Development Bank (Germany) for the same purpose. Foreign nations are also offering their knowledge and expertise to share with the government. France has shown interest in providing assistance to the government for the development of Nagpur and Puducherry, the United States has vested interest in Ajmer, Vizag and Allahabad, while Singapore, Germany and Spain have exhibited interest in providing expertise for the implementation of the various initiatives. Public-private partnerships (PPPs) will have a great contribution in the implementation of the plan. Consulting firms are also participating in the execution by assisting in planning, strategizing and executing the plan. Based on the regional presence and expertise, consulting firms are delegated work in technology, strategy and infrastructure areas. Deloitte has been delegated with the planning and implementation in West Bengal, Bihar, Odisha and Andaman and Nicobar. Finally, the government has assigned capital for special purpose vehicles involving private firms and urban local bodies.

Technology Intervention for Success Technology can be used for development in areas of education, health, crime, energy, traffic and waste management and so on. Electronic delivery of government services and E-Platform for citizens will help resolving minor issues and encourage participation of citizens in governance.

5.3.4 National Optical Fibre Network (NOFN)

This initiative aims to connect the gram panchayats of the country. The program involves development of a high-speed digital highway to connect 250,000 gram panchayats using optical fiber. This is the world's largest rural broadband project.

Progress For the establishment and management of NOFN program, Bharat Broadband Network Limited has been set up. The program has been progressing slowly and for now around 1 percent of the gram panchayats have been covered under Bharat Broadband project and, therefore, the deadline for completion of the program is now 2019.

5.3.5 *Wi-Fi Hotspots*

This project aims to develop Wi-Fi-hotspots in the country to provide digital connectivity across India.

Progress Free public high-speed internet connection has been set up at several locations such as railways and metro stations. Cities like Mumbai and Delhi have Wi-Fi facilities.

Technology intervention for success High-speed high-intensity routers can be used to develop internet connection in public places. The electronics development fund can be used for the effective implementation of the program. India's initiative for becoming a zero net import country for electronics manufacturing under the Digital India campaign will help the implementation in a cost-effective manner.

5.3.6 *Skill India Initiative*

The aim of this program is to provide training to 400 million people belonging to different areas in India by 2022. Due to the lack of the skilled workforce, the success of the Digital India program is hampered. This initiative is, therefore, important for the success of the Digital India program.

Progress Fifty thousand youth in 100 job roles will be trained under the Pradhan Mantri Kaushal Vikas Yojana (PMKVY). SMS campaigns are used to train 400 million people. Recognition of Prior Learning is a government initiative to recognize and certify youth for their skills. The government also proposes to grant loans of INR 5000 to INR 15,000 to the youth for skill development.

Technology Intervention for Success The training centers must be equipped with high-speed Wi-Fi facilities and video facilities for enhancing the outreach and scalability of the project. Mobile applications can also be proved to be useful for skill development.

5.3.7 *E-Hospital*

Under the Digital India program, E-Hospital initiative has been launched and managed by Department of Electronics and Information Technology. This program involves an online registration system linking all the hospitals

across the country. This program aids in the registrations and appointments based on Aadhaar. The initiative provides facilities like online registration, online diagnostic reports, fees payment, appointment and availability of blood online.

Progress The website—ors.gov.in allows tracking of data and registrations and also provides facilities like online diagnostic reports, fees payment, appointment and availability of blood online. The website is fully functional and is updated regularly.

Technology Intervention for Success Efficient database management can prove to be important to access facilities in other hospitals. Analytics can also be used for appointments and other queries which will allow hospitals to deal with resources in an efficient way.

Electronics Development Fund is an initiative that will allow venture capitalists to encourage research and manufacturing of electronics. This will help entrepreneurs to participate in the electronics manufacturing for the healthcare sector.

5.3.8 *E-Sign Framework*

This scheme will allow the users to digitally sign a document online with the help of its Aadhaar card.

Technology Intervention for Success E-Sign framework ensures the privacy and security of the documents. This feature will also allow rapid integration with government departments and procedures.

5.3.9 *Infrastructure*

5.3.9.1 *Broadband Highways*

Under the Digital India campaign, the government has allocated a budget of INR 5 billion for building high-speed broadband highways. This broadband connects all villages, departments, universities and R&D institutions. The broadband development contributes to the achievement of Millennium Development Goals (MDGs) with the help of fiber networks.

The National Optical Fibre Network (NOFN) launched by Universal Service Obligation Fund with the aim of providing broadband access to

250,000 gram panchayats of the country by 2016. BSNL, RAILTEL and PowerGrid Corporation are the PSUs responsible for laying 600,000 KM of fiber across the country.

Faster rollout of optical fiber network across the country would involve the participation of private players apart from the Public sector undertakings. Competition from private players is important to bring efficiency and to reduce the pricing of digital services on high speed. Quicker adoption of services related to bandwidth can be achieved through the innovative techniques and strategies for both operations, sales and marketing.

5.3.10 *Digital Chip Maker*

Digital Chip Maker Intel in association with the government unveiled multilingual training of digital skills and its application. There are multiple modules like financial awareness and inclusion, cleanliness, healthcare initiatives and digital literacy, are included in the scheme of Digital Chip Maker. Intel is working towards creating digital literates in 1000 panchayats with the help of the government.

5.3.11 *E-Kranti*

The project of E-Kranti aims to develop the provision of service delivery through electronic mode for the people of the country. There has been an allocation of around 5 billion Indian rupee for this project. E-Kranti includes sub-projects in the area of farming, planning, security, healthcare, education, law and justice through electronic mode.

5.3.12 *Cloud Computing*

Cloud Computing conceptually refers to the provision of various resources and services through a virtual set-up of the system, without the physical presence of the infrastructure at one place. It allows multiple users to access the services and infrastructure from multiple locations for multiple times. It also helps in dynamic allocation of the resources on demand over cloud platform.

The implementation of the Digital India requires the usage of cloud computing. For this there is work in progress towards formulation of policy related to its usage. Various strategic decisions are being brainstormed so that various services and infrastructure can be mapped to the cloud

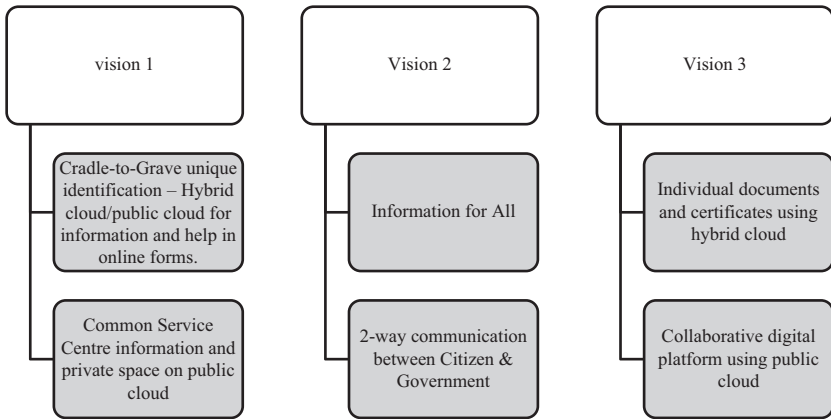


Fig. 5.3 Vision areas enabled by cloud computing

computing which can be provided to the different stakeholders. Architecture principle and data hosting policy needs to be worked upon for efficient delivery of services through the cloud model.

The data should be stored on variety of clouds. Like, the highly sensitive data should be hosted on private cloud, while the less relevant data and information could be hosted on a shared cloud service provider. Informatory services on the government platform could use open-access cloud services like those of Amazon web service or Google web services. Secured network can achieve multiple security checks through this way. Hybrid strategy could also be used for services which require integration, aggregation and customization (Fig. 5.3).

5.3.13 Service Enablement Support for 2G, 3G and 4G

Services would reach Indian citizens through network technology and spectrum. The bandwidth limitation existing across the country has an impact on the services build for public utilization. Network type (2G, 3G or 4G) also has an impact on the provision of services. An architecture design strategy must be developed to decide how services need to be deployed. Provision of Wi-Fi connectivity in government service centers using wireline broadband must be made to reduce the issues faced by the public associated with wireless networks.

5.3.14 *Mobility: Web-API for Internal and External Consumption*

A system based on ‘System of Engagement’ rather than on ‘System of Records’ needs to be developed. This information-centric strategy will enable collaboration and provide dependent services with the help of mobile apps, social media and analytics. This would require separation of data for internal and external consumption and linking of all the data with views and requirements of users.

Accurate information and data must be accessible in a secured medium and on all devices. For this, application should be built, and existing application and systems must be examined as information-centric resource. Data should be classified based on security policy for privacy, confidentiality, classified and open information and on the access to retrieve, create, update or remove (Fig. 5.4).

5.3.15 *Security-Information Categorization*

The digital architecture has security as an important component (Fig. 5.5). The development of digital infrastructure requires:

Organizational Planning—This involves structuring people, processes, data and information.

Security Principles—Policies and guidelines must be made in accordance with regulatory and security compliance.

Vision 1	<ul style="list-style-type: none"> • Mobile phone and bank account for financial inclusion
Vision 2	<ul style="list-style-type: none"> • Availability of Real-time service, digitally transformed services • Financial transactions going electronic and cashless
Vision 3	<ul style="list-style-type: none"> • Collaborative digital platforms
Pillar 5	<ul style="list-style-type: none"> • E-Kranti
Pillar 6	<ul style="list-style-type: none"> • Information for All

Fig. 5.4 Vision areas by mobility solutions

Vision 1	Vision 2	Vision 3
<ul style="list-style-type: none"> • Unique digital identity • Mobile and Bank Account digitization • Safe and Secure Cyber Space 	<ul style="list-style-type: none"> • Electronic financial transaction for cashless transaction 	<ul style="list-style-type: none"> • Documents and Certificates available on Cloud • Collaborative digital platform

Fig. 5.5 Vision areas enabled by security

Architecture—Decisions regarding design patterns and standards.

Backend Application—Backend applications and existing assets must be assessed for their feasibility to digitize.

5.3.16 *Analytics: Unique Digital Identity and Data Linkage with Security*

A centralized secured database has been formed containing all details of the citizens regarding their address of residence, background check, utility consumption details, credit worth, and criminal records. UIDAI or PAN details are needed to connect with citizen details. The database with details of the citizens can then be made available to various parties and will be shared among services within public sectors.

Banks, financial institutions and other sectors are provided with details for analysis of their customers. The data available for individuals such as Aadhaar card, voter IDs, utility IDs, PAN, ration card and property tax can be used for background checks, credit worth, tax default, usage of electricity, gas, water and telephone, travel history, visa status, education qualifications, payment credibility, bank accounts, tangible and intangible assets and address. Analytics is highly useful for ensuring security compliance, confidentiality and privacy laws (Fig. 5.6).

5.3.17 *Machine to Machine (M2M)*

Machine to Machine (M2M) communications is a new way of information transmission that holds a huge opportunity since the mobile subscribers have grown to 900 million. M2M is quite useful for smart utility metering,

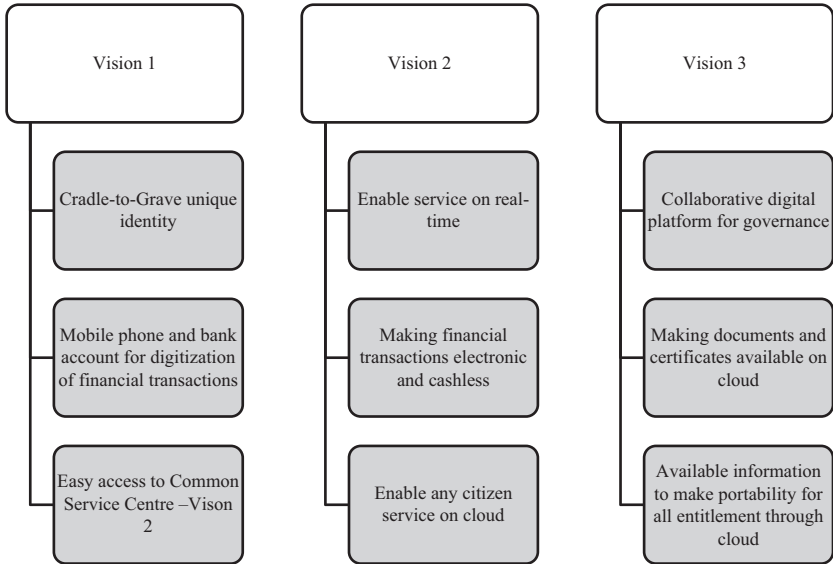


Fig. 5.6 Vision areas enabled by analytics

home automation, logistics, automotive, transport and supply chain and industry wireless automation. M2M plays an important role when machines/meters/logistics are linked to a central system. This connectivity ensures efficiency, accuracy and productivity of the mechanism. Connectivity in the machines within the sectors results in optimization of energy, utility and resources. M2M can help in resource optimization, revenue generation and to reduce revenue leakage. Communication Service Providers (CSP) provides proprietary radio-links, short-range radio signals or cellular-based connectivity that helps connecting machines, meters and resources and digitizing information. The M2M service allows integration of information and high-volume data transfer. With the help of M2M, data about individuals entering the government service centers can be accessed through their device and automatically processed in the background resulting in increased productivity and ease of doing business.

The data for GIS could be collected with the help of the user's identity and the device carried by him. The GIS can be helpful for connecting with machines or vehicles in transportation and even for mapping of the city, to develop decision support systems. There are a number of M2M technology-based applications as discussed below.

5.3.17.1 *Connected Industrial Production*

The working and health of any machine can be monitored remotely through connected industrial production. This will help in betterment of the working of machines as in case of breakdown of the rectification process can be applied at the earliest. In fact connected machines can send message to some other device in case of breakdown or non-working.

5.3.17.2 *Connected Utility Meter*

Various utility services like gas service, electricity service, telephones, and so on in households have meters installed to record the number of units consumed for respective services. To avoid any irregularities, breakdowns or tampering of these meters, centrally connected meters can be useful. Similarly, on vehicle tracking and toll collection can be done on national highways with the help of sensors and connected meters. Toll bills and traffic violation notices can be sent through the connected devices to the owner's E-Mail or phone.

5.3.17.3 *M2M*

M2M is an upcoming technology used for managing vehicles these days. Recently, electronic car REVA by Mahindra Company was built upon machine-to-machine technology for communication between various devices and its internal operations like central car locking system, emergency charging and air condition controlling. Message broadcasting is another application of M2M which can be executed at regional level, national level and even at the global level. Like for smart billboards displaying crucial information like weather updates or stock prices can change the data instantly with the help of M2M technology.

M2M can also be used in critical applications like space-crafts, nuclear installations, military operations, live surgery, and so on. Life-threatening events can be monitored and failure predictions can also be done with the help of M2M.

5.3.18 *Social Media*

The digital transformation is largely based upon social media. Social media was extensively used in the election campaign of 2014. People between the age of 34 and 60 years are the most active users. The usage of social media is improving with the increasing use of mobile phones and affordable data plans. Apart from entertainment, social media is also used to build awareness, help in social issues, bring people together, and enhance governance and employment.

Social media has helped the government in communicating with the citizens and vice-versa. Most of the government departments, agencies and officials are interacting with the citizens through the popular social media platforms like Facebook and Twitter. Citizens are using it to process their concerns and queries related to existing services and upcoming services as well. Even the ministers are using it to promote their departmental work and also to highlight their achievements. They are also directly communicating with a citizen which is giving confidence to the citizens towards the governance. Portal like 'MyGov' is also an initiative in this regard, which is making government pro-active in decision making and innovation. This is also helping in citizen inclusion for the decision-making process and reducing the communication gap between government and a citizen of the country.

5.4 UPCOMING PROJECTS

The department of Agriculture and Cooperation introduced AGRISNET as a mission mode project under National E-Governance Plan of Government of India. As a component of AGRISNET, "Strengthening / Promoting Agricultural Informatics & Communications" has been launched by Ministry of Agriculture. With the help of ICT, agriculture-related information or data can be extracted to improve upon its functioning and bring efficiency and transparency.

E-Biz is currently being implemented by the Department of Policy and Promotion (DIPP), Ministry of Commerce and Industry under Government of India. The project visualizes the transformation of businesses by providing them integrated, transparent and efficient electronic services online via a single window. This service is crucial for businesses, investors and industries to process the information on forms, procedures, license payments and compliances in the business cycle. The E-Biz project aims to transform the service delivery approach from department oriented to customer oriented. The first phase of the project involves offer of 24 services to various departments.

Various E-Governance projects are taking place that aim to flow authentication and application towards the next level. Considering security to be a necessity, these programs involves multiple options for security like credential login processes, Security question-based authentication, Security pin number, Biometric authentication and digital signature-based processes. Digital Signature has been recognized as an important part of

authentication and, therefore, has made its place in the E-Governance projects. A Digital Signature Management Cell (DSMC) needs to be established to facilitate the functioning of Digital Signatures across the State departments. The DSMC may have the functionality related to Digital Signature, Authentication, submission of application, Procurement process and handover of Digital signature to the applicant.

IPv4 is a 25-year-old internet protocol with the capacity of 4.3 billion IP addresses. The current version of internet protocol IPv4 is getting outdated with the report growth of internet in coming years. With the advancement in the internet, Internet Protocol version 6 (IPv6) was developed by the Internet engineering Task Force (IETF), which is an advancement on the address capacities of IPv4 which makes available an infinite pool of IP addresses.

The state requires an immediate action to be taken to identify IPv6 compliant and non-compliant equipment's and software for the implementation. A procurement plan for IPv6 compliant hardware and software also needs to be made by the government. A state-wide action plan also needs to be made to prepare all networking hardware, software and all website to adopt IPv6. There is high scope for the states to participate in the Internet Engineering Task Force (IETF) standardization effort for the infrastructure required for emerging 6TiSCH.

The E-Court Mission Mode Project launched under National E-Governance Plan aims to incorporate technological perspective in the district/subordinate courts of the country. The core objective of the project is the ICT enablement of the courts and provision of designated services to litigants, lawyers and the judiciary with the help of ICT. The basic infrastructure for ICT enablement has already been developed, such as installation of computer hardware, Local Area Network (LAN), internet connectivity and connection of application software at complex of each court. The courts were also provided with facilities like laptops, laser printers, broadband connectivity, and judicial officers were also provided ICT training.

For further technological penetration, Universal computerization of all the courts, use of cloud computing, digitization of case records of last 20 years and enhanced availability of E-Services to lawyers and litigants through E-Filing, E-Payment gateways and mobile applications have been adopted.

The Phase II of the ICT enablement of E-Courts project has been approved and a budget of INR 1670 Crores for the project has been decided. The project comes under the purview of Digital India program

of the Government of India. The Phase II of the project involves computerization of courts plus introduction of the automation of workflow management that would enhance the control over the management of cases. Phase II involves a step further towards ICT enablement of the courts which will include installation of touch screen-based Kiosks with printers in each court complex, use of mobiles to fetch information, implementing change management and process re-engineering in courts, video conferencing facility at all court complexes and corresponding jails, use of E-Filing, E-Payment and mobile applications. These services would be provided through the judicial service centers. Hand-held process service devices would also benefit the judiciary and process servers to enhance transparency and time-bound delivery of court notices and summons. Phase II also encourages the use of Digital Signature Certificates (DSCs) for court officials in issuance of E-Documents to lawyers and litigants. Digitization would also benefit in areas like court management system document management, Judicial Knowledge Management and Learning Tools Management. And for the courts to contribute to the environment, the use of solar energy has also been proposed at complexes of courts.

Since the project comes under the Digital India campaign of Government of India, the objective of the project falls in line with the objective of Digital India Program of the Government of India emphasizing on citizen-centric services providing governance and services on demand to every citizen and digitally empowering them. Data analytics will be used by the government to process ideas generated by various E-Governance portals and to use it for better governance.

5.5 FOCUS AREAS

5.5.1 *Digitally Green Agriculture*

The Indian agricultural sector contributed around 15 percent to the GDP in the year 2013–2014. More than 50 percent of the population is employed in the agriculture and allied sectors. The rapidly increasing population needs to be fed and, therefore, agriculture should produce more. To accelerate the growth of agricultural sector, ICT tool should be utilized to boost the economic growth of the country. The lack of knowledge about new technologies and initiatives by the government makes the productivity of farmers low. Social media can help in removing middlemen and connect buyers and farmers. For example, as per a Deloitte study,

Facebook has a global economic impact. Facebook enabled \$4 billion economic impact and created 335,000 jobs in India in the year 2014. Facebook groups have been formed where farmers buy and sell to meet the demand-supply gap. ICT tools like M2M can be used to improve productivity by appropriate use of pesticides, fertilizers, and other farm resources based on soil detection, weather conditions and so on. Geographic Information System (GIS), Geographic Positioning System (GPS), monitors and controllers for agricultural equipment can allow farmers to direct equipment movements using electronic guidance. Precision farming is another ICT tool which helps in various agricultural activities such as yield monitoring, yield mapping, variable rate fertilizer, and variable spraying. Soil Health Card software and web-based software for nutrient management are used under the E-Governance program for eight states (Deloitte 2016).

5.5.2 *Education*

Education enhances knowledge and skills and helps in socio-economic transformation of the country. The Indian education market was worth \$92.98 billion in 2014. From FY05 to FY12, the sector grew at a CAGR of 16.5 percent. Social media and mobile phones have provided an efficient platform to provide education in an efficient way. The industry is flourished with innovative ideas to educate the masses in an economical way. These innovative ideas include Fisher Friend, Pragati, English Seekho, iPerform and so on. Mobile education is growing fast, and it is estimated that it will be a \$70 billion market in 2020.

The government has assigned a budget of INR 1 billion for developing virtual classrooms and online courses. Virtual classes and online courses need strong data connectivity and improved IT infrastructure. The Massive Online Open Course (MOOCs) are easily accessible and have no restriction on class size which makes them easy to adopt (Deloitte 2016).

5.5.3 *Healthcare*

The Indian healthcare sector is growing at the rate of 15 percent CAGR and the industry is expected to grow from \$78.6 billion in 2012 to \$158.2 billion in next five to eight years. Although the growth rate is promising, the industry still has many faults such as a lack of proper infrastructure, workforce, unequal access to healthcare facilities and high healthcare costs.

These issues in the healthcare sector can possibly be resolved with the help of digital transformation of the healthcare sector. Various digital facilities need to be introduced that can change the face of the industry such as hospital information system (HIS), electronic health record (EHR) and picture archival and communications systems (PACS). Some of these initiatives have been introduced by the Indian government under the E-Governance plan but proper implementation is required to allow change and improvement in the sector.

Telemedicine is the new trend in the industry which is growing with CAGR of 20 percent and will serve as a solution for rural and remote people. Telemedicine is the solution for higher costs of specialized doctors that visit rural areas from urban areas. Telemedicine allows remote communication between physicians and patients. Very large population of India has no access to affordable medical treatment today. Affordable primary medical and diagnostic care will be accessible with E-Visits and necessary infrastructure.

Cloud technology can be used by the doctor to store and access data from anywhere, anytime and to deliver a real-time solution to patients' problem. The medical database of the required check-up data can be viewed directly by the patient through internet connectivity.

The M2M healthcare device market in India is growing with a CAGR of 33.81 percent from 2011 to 2016. It is a highly valued sector aiding in many medical cases. For instance, in the condition of heart arrhythmia, M2M-based heart-monitoring device records the daily condition. The recorded information can be transferred with the help of a mobile network or internet so that doctors or care-takers can review the person's cardiac condition and provide support accordingly. Many such M2M-based devices are already being used worldwide. Its usage must be enhanced in India as well. Real-time location and Global Positioning System (GPS) are other ICT tools that can be used in medical industry. These tools help to track the ambulance and suggest the shortest route to hospital. Dementia and Alzheimer patients can also be tracked by GPS (Deloitte 2016).

5.6 SECURITY CONCERNS

Under the E-Governance plan, cyber security concerns play a major role. Cyber security requirements need to be changed with the change in threat environment. Regular updates are required in threat landscape in order to avoid emerging attacks. Sharing of information regarding emerging threats

and vulnerabilities can help prevention of cyber-attacks. This can be done through collaboration of various agencies. A holistic approach is required to secure Indian Cyber Space. The cyber security strategies of the XI Five Year Plan will be implemented and improved, while new initiatives would be introduced to tackle with emerging threats and changing technology picture (Ministry of Electronics and Information Technology 2016).

During the XII Five Year Plan, some new cyber security strategies have been planned and projected:

- (a) The policies need to be altered according to the changing threat landscape, complex cyber space and convenience of obtaining resources in the area of cyber security.
- (b) Public-Private Partnership is a solution for security issues and for prevention of security issues.
- (c) Security infrastructure, skills of technical employees and enhancement of awareness is required by country's cyber space to prevent cyber-attacks, and to minimize the national vulnerabilities to cyber-attacks.
- (d) Collaboration and interaction between important stakeholders such as Government sector organizations, sectoral CERTs, International CERTs, product and security vendors, NGOs security and law enforcement agencies, service providers including ISPs, academia, and media, and cyber-user community is required to prevent cyber-attacks.
- (e) Mock drill must be conducted to prevent cyber crimes and to assess the preparedness of sector organizations about whether they would be able to resist cyber-attacks and improve the security posture.
- (f) Research and technology demonstration, proof of concept and test bed projects in areas of cyber security linked with recognized R&D institutions must be supported by the government.

5.6.1 *Focus Areas*

Six areas of cyber security will be focused by the government during the XII plan period:

- (a) Legal framework,
- (b) Security policy, compliance and assurance,

- (c) Research and technology in cyber security,
- (d) Concentration on early warning and response under security incident,
- (e) Security awareness, enhancement of skills, and
- (f) Public-Private Partnership.

Legal Framework

In order to enhance the legal framework of cyber security concerns, research projects related to cyber laws and related aspects like, E-Commerce, encryption, IPR issues, and privacy need to be conducted. Such research projects would provide insights about the cyber laws and issues related to the cyber security which would help in creating a better legal framework. Moreover, a database of legal cases related to cyber fraud decided in India must be created. A policy and procedure need to be devised for extraction of authentic data stored in repositories and hosted by Indian companies on servers abroad for access for lawful purpose. An encryption/decryption framework is also essential considering the concerns of both industry and Law Enforcement Agencies.

Security Policy, Compliance and Assurance

The compliance and assurance of security policy requires following below-mentioned measures:

- (a) Cyber security studies and surveys needed to be conducted annually;
- (b) Crisis management plan needs to be developed and implemented;
- (c) Security audit and assessment needs to be done and certification infrastructure has to be enhanced. This involves enhancement of third-party certification, empanelment and ratings of auditors, cyber security drills, technical security testing and self-certification;
- (d) A national cyber security index needs to be generated which would lead to national risk management framework; and
- (e) IT product technical security assurance mechanism needs to be enhanced which would improve Common Criteria security test/evaluation and Crypto Module Validation Program.

Cyber Security Research and Development

Research and development will be carried out with basic focus on setting up test beds, development and demonstration of technology, transition and commercialization of technology. Public-private partnership needs to be used for joint R&D programs. A joint effort of industry and universities is important for the implementation of the activities. The major steps proposed in this respect are as follows.

- (a) Taking efforts to set up center for excellence in Cryptography, Mobile Security, Malware Research, and Cyber Forensics
- (b) Technology transfer will be promoted and prototype to production of products will be facilitated
- (c) Cryptanalysis, algorithm design/development/hardware realization will be implemented
- (d) Programs for attack detection, protection, recovery and prevention will be installed
- (e) Security solutions for cloud environment
- (f) Mobile security solutions
- (g) Security requirements in SCADA systems will be fulfilled
- (h) Assurance framework of Cyber security for the government sector will be introduced

Security Incident: Early Warning and Response

To rapidly respond to the security incidents and to facilitate information exchange required for cyber security, National Cyber Alert System will be strengthened. Development of infrastructure and use of secure computer and communication networks are the priority actions required to be taken by the government to strengthen the IT sector.

The major actions include:

- (a) Establishment of Threat, Vulnerability and Malware Research Centre has been proposed
- (b) Improvement of CERT-In Operations
- (c) Development of sensor/honeypot networks at key ICT installations
- (d) A knowledge repository at the central level

- (e) Development of a response mechanism at national gateways
- (f) In order to promote authority and accountability related to cyber security defense measures, Security-Information Sharing and Analysis Centres (ISACs) Cyber Security Operational Centre (CSOC) will be set up to enhance coordination with regional level Cyber Security Help Desks
- (g) Development of Botnet Cleaning Centres in the government, infrastructure and public sector organizations.

Security Awareness, Skill Development and Training

There is a need to develop capacity, skills and training mechanism to build a strong cyber security workforce. Human resources are needed to cope up with the security challenges arising at government as well as private sector. Skill upgradation and retraining of existing employees must also be promoted.

The proposed measures include:

- (a) Mass awareness campaign to create awareness related to cyber security among citizens is to be launched.
- (b) Electronic media is to be used to create awareness.
- (c) Cyber Security Training Labs/facilities will be developed across the country.
- (d) Development of examination, accreditation and certification infrastructure.
- (e) Cyber Security Concept Labs, Cyber Security Auditing of Assurance Labs, Digital Cyber Forensic Training Labs and SCADA/embedded security labs have been proposed to be developed.

Collaboration

Global cooperation is required to enhance cyber security. Shared understanding and interaction among agencies are the keys to mitigate cyber-attacks. CERT, law enforcement agencies and global agencies must coordinate to mitigate cyber threats. A well-established cyber security collaborative framework is required to be developed with the collaboration of government, private sector, partners, academicians, and national and international agencies. The Department of Information Technology should take charge of the collaboration for cyber security facets.

- (a) Overseas CERTs and industry must be coordinated to promote cyber security
- (b) Preemptive involvement at UN and Asia-Pacific level
- (c) Awareness mechanism will be introduced within the country
- (d) Coordination with law enforcement agencies and judiciary
- (e) Development of a tiered structure for information sharing
- (f) Collection of cyber security policy discussion and decisions

So, the major targets for cyber security focused in the XII Five Year Plan include identification of gaps in the existing policy and addressing them, development of national cyber security index for risk management, development of centers of excellence for advanced Cyber Security R&D, net traffic analysis, formal security education and awareness programs and promotion of collaboration between national and international agencies on cyber crimes and security (Ministry of Electronics and Information Technology 2016).