



Emerging Technologies in the Public Sector

UN E-Government EGM Meeting Background Paper

4 May 2017

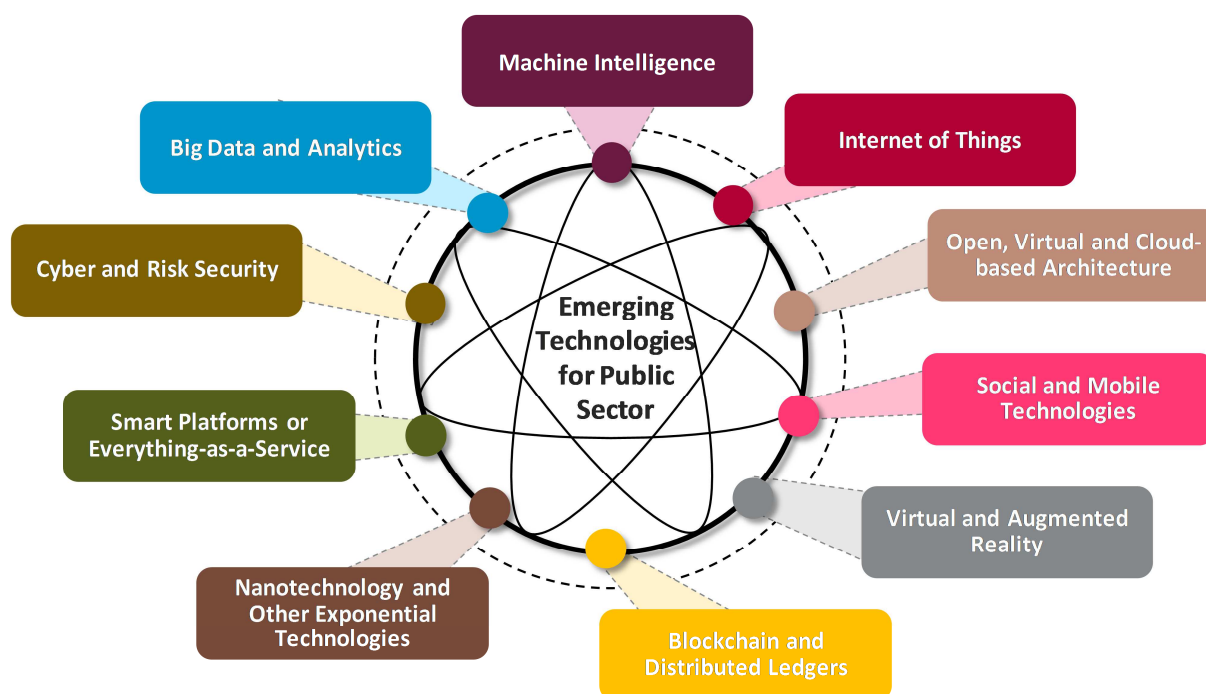


1. Emerging Technologies in Public Sector^{1 2}

Over the next 2-3 years, the government or the public sector is expected to be impacted by the evolving technologies and they quickly need to adapt to these technologies to remain efficient, transparent, accountable, and user centric. These emerging technologies have the potential to disrupt the traditional way of operations and delivery models across functions and domains by the government organizations. Some of the major technology trends that are fuelling innovation and growth in both the private and public sectors are mainly related to the universal forces such as digital, analytics, cloud, core modernization, and the changing role of IT. Also, social and mobile technologies, open data initiatives, and application development tools play an important role towards government transformation efforts. Constituent engagement drives transformation both in services delivery and operational efficiency.

As per a Gartner analyst, the national, federal and local governments worldwide are forecasted to spend \$430.1 billion in 2016 (0.3% up y-o-y) on technology products and services, which is a turnaround after a 5.2% y-o-y decrease in 2015. This is further expected to grow to \$476.1 billion by 2020.³

Figure 1: Key Emerging Technologies Impacting the Public Sector



1.1. Machine Intelligence (MI)

Machine intelligence mainly constitutes machine learning, cognitive analytics, robotics process automation (RPA), bots and other artificial intelligence technologies. MI has been rapidly advancing and will provide benefits through enhancing citizen engagement, automating workloads, and increasing workplace productivity. They will impact the society and daily life of citizens and businesses.

Applications in the Public Sector –

¹ [A government perspective: Tech Trends 2017, Deloitte Report](#)

² [Best government emerging technologies, World Government Summit-Indra, 2017](#)

³ [Gartner Highlights Top 10 Strategic Technologies for Government in 2016](#)



- **Smart machines** used as enhancements to existing business practices or newly established for new public services – Capabilities include Machine Learning/Deep Learning, Virtual Personal Assistants, Cognitive Expert Advisors, Smart Data Discovery, Conversational User Interfaces, Natural-Language Question Answering, etc.

1.2. Internet of Things (IoT)

IoT has been defined as a set of physical objects embedded with sensors or actuators and connected to a network (as per a report by the Center for Data Innovation). This technology is in its infancy in the public sector, at both the federal and the local levels. Benefits from its early adoption lead to higher civic participation and enhanced efficiency, transparency and accountability of public institutions.

Some of the challenges for IoT adoption include lack of strategic leadership on usage of IoT; lack of skills in using the data generated by IoT; insufficient funding to modernize IT infrastructure; unfavourable procurement policies for governments to easily adopt the technology; risk and uncertainty about privacy, security, interoperability and return on investment.⁴

Applications in the Public Sector⁵ –

- **City-wide wireless devices:** Bus stops, post boxes, telephone booths etc. all connected
- **Smart public services to reduce costs (smart parking, health monitoring):** Devices which result in greater awareness of health, nutrition and exercise eases the stress on health services
- **Surveillance / data monitoring:** Sensors that can monitor foot traffic, street traffic etc. can be used for city planning, road planning, dynamic toll pricing, flood management etc.
- **Smart public services to reduce costs (road monitoring / traffic management):** Sensors to detect congestion, road damage, pedestrian footfall etc.
- **Monitoring weather & environment:** Better weather monitoring allows for smarter planning, prediction of safety measures
- **Health care and life sciences:** Monitoring patients vital signs at home, improving drug compliance
- **Smart Meters** used by utilities to save energy

1.3. Open, Virtual and Cloud-based Architecture

The setup of automated, flexible, open, virtual, and cloud-native architecture has been trending for most of the innovative companies and organizations. This is going to be a potential trend for the government organizations over the next 1-2 years, however setting up such architecture will be a challenge due to the high costs involved in the IT infrastructure. Benefits include driving efficiency, lowering costs, enhancing outcomes through streamlining operations and integrating the IT systems, transparency, and citizen engagement. Technologies used will be cloud-based, automated and open data platforms. Challenges mainly relates to vendor dependencies, loss of control of the internal teams and security risks.

Applications in the Public Sector –^{6 7}

- Autonomic platforms are being used across the public sector, including data centre, server, network, and storage virtualization. These platforms could deliver services such as identity management and verification, payments, reusable application services and notifications (for example, SMS and email).
- Open-data platforms are adopted by the governments to facilitate transparency and higher citizen engagement.

⁴ [Government Technology Magazine, 2017](#)

⁵ Capgemini Consulting Analysis

⁶ Public Sector Tech Trends, Deloitte, 2017

⁷ [Best government emerging technologies, World Government Summit-Indra, 2017](#)



- Cloud-based technologies and platforms are increasingly used in the public sector for cost efficiency, scalability, ease and quality of data customization, and ability to share ICT resources among multiple agencies. Some of the cloud based technologies used in public sector were –
 - Cloud service/data brokerage (open data)
 - Fog Cloud, global dynamic automation from servers to mobile devices
 - High performance computing
 - Native cloud frameworks for mesh app and micro-services
 - PaaS and hybrid cloud enabling platforms

1.4. Virtual and Augmented Reality

Virtual and Augmented Reality (VR and AR) technology are being increasingly used in the government to streamline processes and improve citizen experience. Some of the early adopters were the military, law enforcement and national security agencies. These technologies deliver context, immersion and have potential to retool training environments, redefine the role of field service workers, improve communication, and reshape government business processes. Technological improvements, such as the digital twin concept, which is a cloud-based virtual representation of a physical asset are being adopted that will redefine markets, industries and societies.

Applications in the Public Sector –^{8 9}

- **For training purposes:** to train astronauts for jobs in space such as repairing the exterior of the International Space Station
- **Use of VR and AR based wearable glasses to enhance communication, quick and improved decisions:** NASA use wearable glasses to interact with holograms, enhancing communication between astronauts and ground teams. The Office of Naval Research developed augmented reality glasses that can send critical data to war fighters on the battlefield.
- **VR medical visualisation platform used in patient engagement and healthcare**

1.5. Blockchain and Distributed Ledgers

The blockchain is a digital, decentralized ledger that keeps a record of all transactions that take place across a peer-to-peer network and it allows assets transfer without the need for a centralized third party. It has applications beyond bitcoin and cryptocurrency. As an alternative to centralized governance, blockchain has the potential of rewriting notions of transaction, licensing, identity, and contract management. The adoption of the technology is nascent for governments; however, it will help benefit the government agencies by significantly improving efficiency, costs, reliability, security and decentralisation of data.

Applications in the Public Sector –¹⁰

- **Distributed Ledger Technologies (DLTs) are applied in three different ways:** within currency applications, to manage and create new forms of contracts, to enable new applications by third parties¹¹
- **Use of blockchain for record management systems** in the areas of healthcare and other government agencies where bulk of data is captured
- **Use of public blockchain (bitcoin environment):** new versions of loyalty schemes, new versions of coinage, ways of exchanging foreign exchange and adding smart contracts onto that public chain
- **Land Registry** where smart contracts are being tested on the blockchain for the management and visibility of land titles and changes to them
- Potential use could be in the department of **tax and welfare agencies**

⁸ Public Sector Tech Trends, Deloitte, 2017

⁹ [Best government emerging technologies, World Government Summit-Indra, 2017](#)

¹⁰ [What blockchain can do for government, Capgemini Financial Times, 2016](#)

¹¹ [Distributed Ledger Technology: beyond block chain; A report by the UK Government Chief Scientific Adviser, 2016](#)



- **Blockchain-as-a-service** offered to the public sector organizations through the GDS Digital Marketplace on G-Cloud 8

1.6. Nanotechnology and Other Exponential Technologies^{12 13}

Exponential technologies (nanotechnologies, energy systems, biotechnology, and quantum technologies) are expected to have accelerated uses and early adoption in the public sector over the next three to five years.

Applications in the Public Sector –

- Nanotechnology-enabled catalysts that improve the combustion of methane to decrease greenhouse gas emissions
- Nanosensors to detect moisture levels and diseases in food crops, help firefighters and soldiers to detect toxins in the air
- Quantum computing for cybersecurity

1.7. Smart Platforms or Everything-as-a-Service

Smart platforms or the approach of Everything-as-a-service is highly trending for the public sector as the leading government CIOs are transforming systems into services and platforms. The smart platform ecosystems comprise a large number of technologies such as Big Data platforms, Communication Networks or IoT platforms. This platform helps government organizations to modernize their core systems, create new operational models and modes of service delivery, thereby resulting in better efficiencies and new ways to engage constituents.

Applications in the Public Sector –

- **Reusable, Java-based processing services** for the Internal Revenue Service organization
- **Big-data platforms used for citizen engagement and analytics:** water leakage system
- **Transformation of core platforms with new mobile and digital capabilities to enhance customer experience:** Amtrak is modernizing its 40-year-old pricing, scheduling, and ticketing system with new mobile and digital technologies

1.8. Big Data and Analytics

Analytics provide insights from the data that can steer actions towards organizational efficiency or program effectiveness. Its increased usage across all stages of business activity and service delivery in leading government agencies have led to a shift from dashboard reporting to independent business processes and business intelligence capabilities for improved real time context-based decisions.

Dark Analytics i.e. insights from unstructured data sources such as documents, videos, tickets, texts, and tweets that remain in the “dark” also signifies huge opportunity in the public sector.

Public sector organizations are now required to deliver better services by following its citizen’s needs through digital transformation. Social media analytics, customer engagement hub and personal analytics emerge as the key tools for government’s digital transformation. Also, governments have to adopt new approaches that consider innovative delivery models, new technical platforms, and novel governance tactics unlock the opportunity from data and technologies.

The challenge is in leveraging real-time data from different sources continuously and linking people, cities and governments assuring security and privacy.

¹² [Government Technology Magazine, 2017](#)

¹³ Public Sector Tech Trends, Deloitte, 2017



Applications in the Public Sector –

- **Use of analytical tools to draw insights from texts and email** correspondence for better customer engagement at a lower cost
- **Use of big data platforms** to build an efficient and sustainable system accessible by all and that responds to citizen's needs – Healthcare system in public sector
- **Use of advanced analytics** to combat food illnesses

1.9. Cyber and Risk Security¹⁴

The threat of cybersecurity is constantly growing, but it is only one aspect of a complex, multifaceted set of threats and risks faced by the government CIOs. Threat-aware, risk-based security approach must be adopted by CIOs so that governments are able to make informed decisions about risks in a holistic manner, able to wisely allocate resources and engage senior leadership in risk-based decisions. However, CIOs responsible for protecting sensitive data face challenges by frequently changing regulatory landscape, ongoing budget limitations and a shortage of skilled workers.

Applications in the Public Sector –¹⁵

- **Cybersecurity solutions for the public sector** including capabilities –
 - Risk assessment
 - Security related plans, policies and procedures
 - Integration and testing including biometrics, VPNs, crypto management, etc.
 - Compliance and testing
 - Certification and accreditation
 - Incident detection and response
 - Managed security services
 - Threats & vulnerability analysis

1.10. Social and Mobile Technologies¹⁶

Mobile and social internet usage have reignited citizen engagement in the public sector. Globally, more than 75% of the online population uses social media, and citizens expect governments to be online and social. Also, mandates and new guidelines (The Open Government Partnership's Open Government Declaration) at the international level require governments to actively encourage citizen engagement by providing services through multiple channels. Internet usage through personal computers has almost doubled from 2005 to 2010 globally, and internet access through smartphone has also grown rapidly. Businesses have also expanded their online reach, with 40% growth in web sales across all companies from 2009 to 2010.

Applications in the Public Sector –

- Mobile and web-based platforms that enable citizens to report, view, or discuss local issues or public work requests such as waste removal, street light repair or pothole repair
- Use of social media by government CIOs to communicate with citizens and businesses
- Mobile applications and websites development to solicit citizens' input for any potential development
- Apps for news and payment information related to electricity and water departments

¹⁴ [Gartner Highlights Top 10 Strategic Technologies for Government in 2016](#)

¹⁵ [Cybersecurity solutions for the public sector, CGI, 2016](#)

¹⁶ [Governments Embrace New Modes Of Constituent Engagement, Forrester, 2016](#)