



# National Strategic Roadmap on the Internet of Things

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## Information about Publisher

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IET Sri Lanka Network has developed this “National Strategic Roadmap on The Internet of Things” in consultation with the Ministry of Digital Infrastructure and Information Technology and all the relevant stake holders.



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## Foreword

“Intelligent interactivity between humans and things to exchange information and knowledge for new value creation” can be considered as the common definition for IoT (Internet of Things). In simple terms, IoT is the network of physical devices such as home appliances, office appliances, factory appliances, personal appliances, medical appliances, machines, vehicles, buildings and other devices embedded with electronics, software, sensors, actuators, and network connectivity that enable these objects to connect and exchange data. The concept of the Internet of Things brings several disciplines of engineering and technology into one common platform and makes their output to be productive, intelligent and efficient.

IoT is the next industrial revolution which has already grown significantly in many other countries. This opportunity may not have materialized in Sri Lanka without the critical enabling conditions. Therefore, the IET Sri Lanka Network in consultation with Ministry of Digital Infrastructure and Information Technology has formulated this National Strategic Roadmap on the Internet of Things (IoT).



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# 1. Introduction

The basic concept of the Internet of Things is connectivity. Data has a synergetic effect - once interconnected it produces more value than alone.

When equipment is connected by a communication platform, and allowed to interact with human and the environmental stimulus, such interactions will produce data streams. If an analytics and application layer is allowed to interact with these data streams these analytics and application software will transform these data into valuable insights. These insights can be utilized in various service domains to enhance human understanding and to create actionable knowledge in new value creation.

The term Internet of Things (IoT) was first coined by Kevin Ashton, the co-founder of MIT Auto ID laboratory in 1990s<sup>1</sup>. Though the major players’ perception of IOT differs, marginally everybody’s common definition can stand as;

*“Intelligent interactivity between human and things to exchange information and knowledge for new value creation”*

IoT can be over simplified by denominating it as interplay between three components, as shown in Figure 1 below, (a) Things<sup>2</sup>, (b) Connectivity, and (c) Analytics.

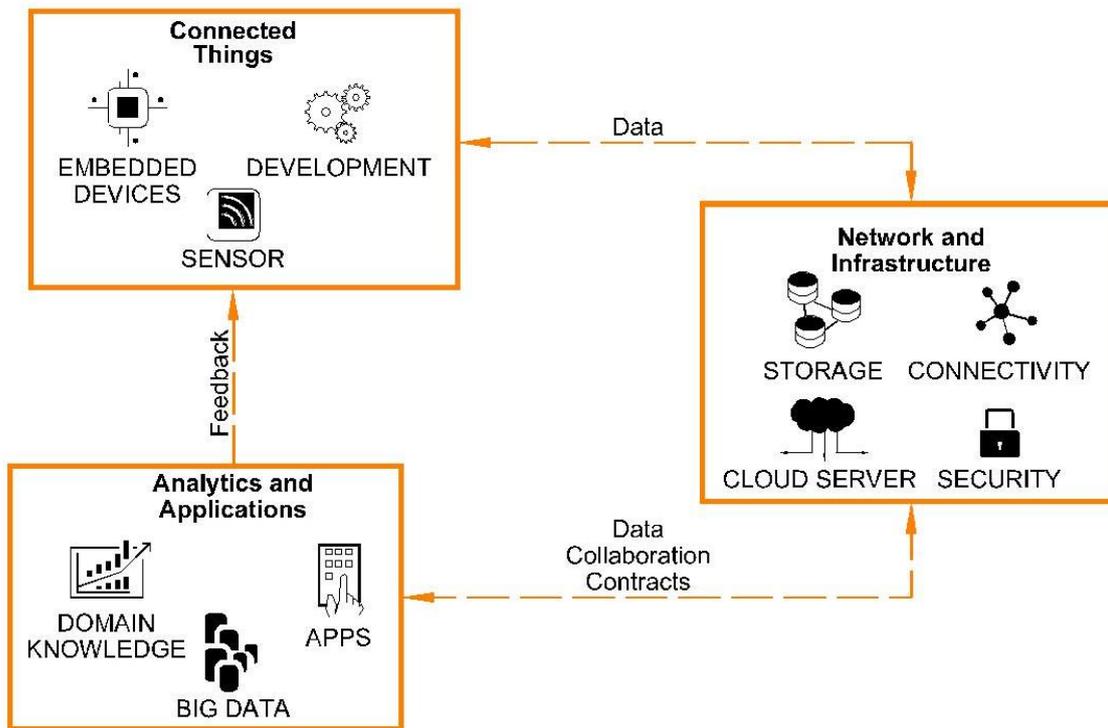


Figure 1 : Basic Components of IoT

<sup>1</sup> Ministry of Science , Technology and Innovation (MOSTI), National Internet of Things (IoT) Road Map, MIMOS BERHAD, Malaysia, 2014

<sup>2</sup> A “Thing” refers to an intelligent machine capable of sensing its environment, processing data, communicating with other machines and acting on commands/decisions.

Connected things comprise of embedded devices, sensors and firmware. The connectivity refers to the communication infrastructure usually through the Internet establishing real time communication between devices (M2M communication) and services using secure communication technologies. The analytics component include analysis of large volume of data received from thousands of devices in real time to provide intelligent decisions back to the machines on ways to interact with its environment. Analytics usually involve the use of big data and related technologies.

It should be noted that in a formally organized socio-economic structure, these three elements are scattered across various sectors. The *Connected Things* are mostly in transport, health, agriculture, manufacturing and energy sectors. *Connectivity* is primarily the nation's communication and IT infrastructure. *Analytics* is mostly by function-specific agencies geared to provide data services as well as *Applications* by full spectrum of stake holders ranging from individual developers to large scale corporates.

The socio-economic interaction of these three elements is not sufficient to generate the required degree of interplay and freedom to metamorphose the country's data network into IoT, unless the Government acts as a catalyzing agent. Therefore, the motivation for this road map can be declared as follows;

*“Sri Lanka as a nation awaiting a breakthrough growth, the advent of the IoT could be a game-changer. But that opportunity may not materialize without the critical enabling conditions. This roadmap identifies how we can catalyze IoT led economic growth for development and prosperity”.*

## 2. Preamble

The world is at a continuous growth. But what people meant by 'Growth' was different in various eras. Fifty years back, the purpose of growth was for solving the compelling problems of the world. This is the era in which 'growth' and 'development' was synonymous. Twenty five years ago 'Growth' was creating equal amount of problems to the solutions it provided. Therefore, twenty five years back it was a question whether growth and development were synonyms. Today, growth produces more problems than it solves. Therefore, today 'growth' is defined in the context of limited resources called sustainable growth.

For us, Sri Lankans, sustainable development was never a novel concept. Historically, we are inheritors of a development paradigm encapsulated with sustainability. We knew how to place the human development paradigm within the context of the finite environment. The Hunter's concept of development through exploitation had never the concept of the Farmer. The Farmer's concept of development essentially required it to be sustainable, once trapped in an island nation with limited resources.

## 2.1. Mega Trends

The world is undergoing a paradigm shift. Humans are to learn to place their development paradigm within the context of the finite environment and no policy in a country can be developed without due appreciation of this aspect. The world we see today and the world to come in twenty-five years from today will be substantially different. There are four mega trends the socio anthropologists identify as mega trends which will reshape our future. The four mega trends which will create this paradigm shift are,

1. Demographic shift
2. Individual empowerment
3. Food, water and energy nexus
4. Diffusion of power

## 2.2. Demographic Shift

The world's population will be 9.4 billion by 2050. This population will be different to us in three aspects. In developed countries the populations will be aging while the developing countries will host increasing young populations. The female population will increase. Sixty five percent of this population will be city dwellers. Mega cities, mega regions and mega corridors connecting these mega cities or mega regions will emerge in the Asian region.

This will create implications such as;

1. High competition for shelter and security
2. Major challenges of supply chain management and logistics
3. High demand for mobility and health services.

## 2.3. Individual Empowerment

The individual will become more powerful than institutions. The middle class who are extra sensitive to individual rights will be the major class in the world population. Their higher wealth and knowledge leads to a paradigm shift in politics. The concept of government and its organizations will be increasingly pressured to connect and resonate with individual needs providing personalized products and services, rather than serving a mass market approach.

This has three implications namely,

1. Access to information will be a higher level human right
2. Products and Services will require to be personalized
3. Mentality of “the world-revolves-around-me” will be the key driver of the market.

## 2.4. Food, Water and Energy Nexus

The Food, Water and Energy nexus will be impeding development due to the scarcity of resources and environmental degradation. Natural resources will be costly and the impact on the environment by the exploitation of such resources will be factored into costing. Therefore, green life will be many times cheaper. Food wastage in its life cycle which ranges to staggering percentages of 30 – 50% today will be reduced. Radical changes to agriculture will come.

This has three implications namely,

1. Green revolution in energy through sustainability
2. Innovative agriculture to produce more with “less and less”
3. Food chain management with zero waste.

## 2.5. Diffusion of Power

Power of the world while shifting from west to east is diffusing among individuals. The consumers are going to be prosumers in defining their needs rather than the passive receivers at the end of the value chain. The global interconnectivity will create an open and free society. The population is going to be educated and informed. The internet, television and radio are going to be universal platforms for collective thinking. This will put unprecedented demand on accountability of politicians and governmental institutions.

This has three implications namely,

1. Wide sharing of information
2. Democracy to be shifted from representative to full democracy
3. Fall of the monopoly of traditional bureaucracy

The major sectors of the society under these pressures will be transformed in to more open, transparent, efficient, sustainable and individual-focused services. Table below enumerates such change in summary.

Table 1: Market Value Shift

Vertical Market	As Is	To Be
 Agriculture	Resource dependency & serves as economic power	Knowledge-based & sustainable agriculture businesses
 Education	Structures & curriculum	Open & personalized lifelong learning
 Healthcare	Curative & disease treatments	Wellness management: Self-care & self-diagnosis (prognosis)
 Government Service Delivery	Standardization	Open & smart government services
 Smart City	Reactive management	Integrated & seamless service delivery
 Environment	Reactive management	Preservation & restoration

### 3. Enablers for IoT

The technology will be immensely pressured to provide solutions for these requirements. IOT technologies will be the major trend setter in this process.

There will be (six) major enablers which foster the growth and flourishing of IoT, namely,

1. Big Data Analytics
2. Cloud Computing
3. Connected Things
4. Open Source and Community Based Development
5. Artificial Intelligence and Machine Learning
6. Block-Chain Technology

The IoT under the influence of these enablers will evolve from a humble *Machine-to Machine (M2M)* network to a social wide platform of *Internet of Services (IoS)* as shown in below Figure 2.

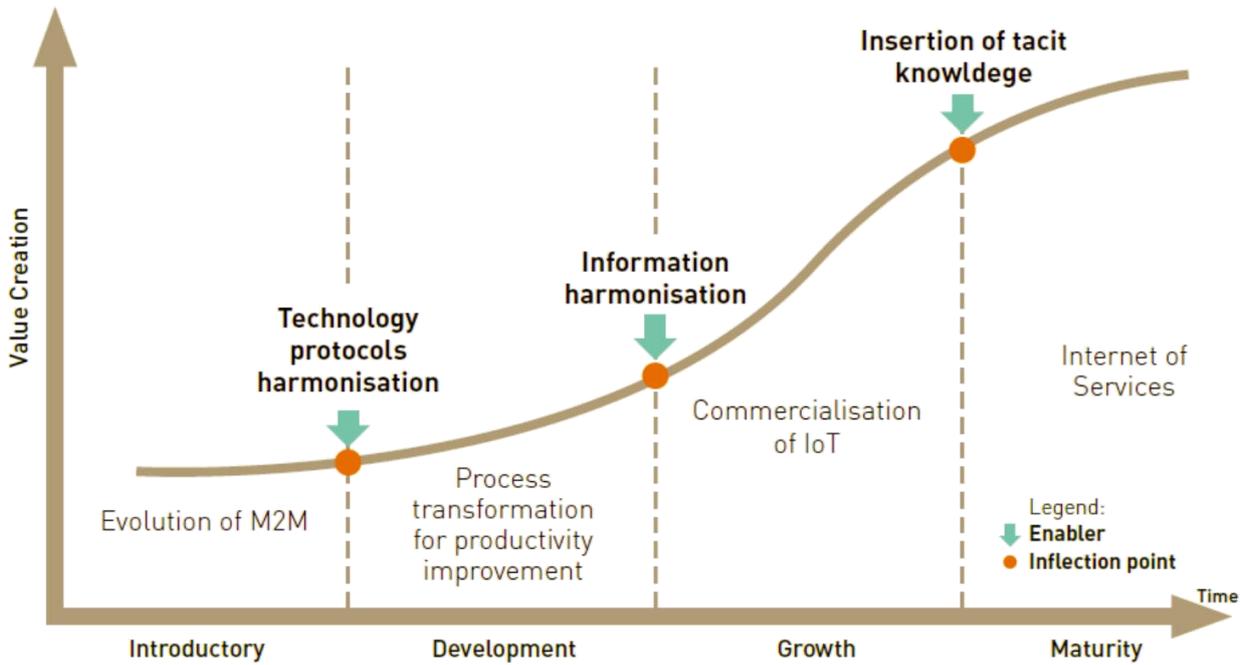


Figure 2 : Technology Transformation

The paradigm changes as discussed above are to take place in the ambient of the mega trends in the future. The institutes, nations and the world as a whole has the above discussed tool kit in hand to coin the possible solutions in adapting to these mega trends. The IoT policy of a country should be futuristic and robust enough to forecast and plan such strategies. The below IoT policy is defined under the lens of this analysis.

## 4. Status quo, country readiness and transformation

Sri Lanka today is a country with middle income. Our social development indices are higher than the economic development indices. This is mostly due to free education and our rich historical background. Our **Government** still is **administrated** as a traditional welfare government with a representative democratic led executive. The government services are mostly process-based. The government functions are primarily welfare and regulation based. **Agriculture** - one of the largest sectors of the country operates still as a resource based industry. **Manufacturing** sector is low in productivity and highly labor intensive. **Education** is highly structured and curriculum based. Still most of the education takes place in a classroom environment through traditional teacher-student relationship. **Healthcare** of the country is primarily curative and treatment based. The citizens get involved with the health sector when they contract diseases and maintain their contact mostly up to the point they are cured. The health authorities' interaction with the community has still room to grow. **Cities and Local Governments** are reactive in nature. Their services are mostly focused on providing solutions to complaints related to acute issues in their constituency. The local government's interaction with their city management will focus on transport, access control, energy and security. **Environment** protection and its preservation are also based on reactive interactions. The environmental licensing and controls do not have a pertinent monitoring system to ensure due control.

It is said that

*‘a sensible law abiding citizen could pass through his life and hardly notice the existence of the state, beyond the post office and the policemen in the early twentieth century. By the end of the world war there were profound changes in the conception of government which was to continue into the twenty-first century. The reshaping of the modern administrative state was taking place, reflecting the feeling that it was the duty of the government to provide remedies for social and economic evils of many a kind. The enfranchised population could make its wants known and through the ballot box it had acquired the power to make the political system respond’.*<sup>3</sup>

Though in our part of the world, the enfranchised population had well ‘acquired, through the ballot box, the power to make the political system respond to their wants’ it suffers a major incapacity in ‘making its wants identified’.

**The Government** and its executive sectors are going to experience a paradigm change with the advent of IoT as a common platform of data. A new lens to the society will be developed through the interconnected sectoral data and social media portals. The new vision the Government derives of the needs and expectations of its subjects may enable the governments to act more proactively in providing solutions to the wants of their people.

**Agriculture** will transform from a resource based sector to a knowledge based sector. The sustainability and the productivity of agriculture will be the parameters of sectoral evaluation of efficiency and export orientation. The condition monitoring of the farmlands, water quality monitoring, produce monitoring, and the farmland based supply chain monitoring will enable the evaluation of sustainability, efficiency and export orientation of each farmland.

**Manufacturing** will transform into Industry 4.0 by using IoT in conjunction with Big Data Analytics and Artificial Intelligence. Activities engaged in the manufacturing environment such as supply-chain management, manufacturing processes, quality control and assurance, health, safety and environment can be seamlessly integrated for higher productivity and performance.

**Education** sector will migrate from the structured and curriculum based teacher-student system to an open, personalized and lifelong learning process. Students will have multiple accesses to knowledge and the teachers’ role will transform from teaching, to facilitation. The education sector will be dominated by virtual reality, virtual presence and the media based skill and knowledge transfer. Education will be more open and unstructured. One who gets acquaintance with the required material will earn the qualification immaterial of the modality of access.

**Health Sector** will be transformed from today’s emphasis of it being curative and disease based to wellness management, prevention, self-care and prognosis. The citizens will interact with the healthcare authorities for wellness management. Every citizen will be managing their health and continuously connected to diagnostic platforms. The analytic and diagnostic platforms interacting with the wearable devices and interconnected medical databases create actionable knowledge and health alerts.

<sup>3</sup> Wade, H. W. R., Forsyth., C. F., Administrative Law, 13<sup>th</sup> Edition, Oxford University Press, 2009.

**Our Cities and Local Governments** will be subjected to a major transformation. They will become highly proactive and interconnected. They will not wait till problems to be reported as complaints. They will have the required data to derive insight into the developing problems. This will enable our future local governments to act proactively and to acquire a full control of the city and their managing. The city's infrastructure such as traffic, transport, sewage, garbage, water, electricity, public services, environment quality, food supply etc. can be monitored in one central control center where the operations of the city becomes somewhat similar to the operations of an airport.

**Environmental Authorities** will become part and parcel of this monitoring system where the concept of 'Polluter Pays' will be in full operation. The environmental monitoring system will be such that the emissions will be tracked at the point of emission. The environmental impact assessment will be online and the integration of environmental cost to each process will be in 'as occurred' basis. The environment monitors installed in the sensitive locations and connected to a central database will enable such advanced environment monitoring and control system where sustainability is integrated with the environment controls.

## 5. Our Directions and Opportunities

The Technology enablers of IoT will be the modern networks, IoT devices and sensors and the IoT platforms. It is apparent that Sri Lanka as per today does not have a notable footprint in the component market. However, even though we might not be significantly competitive in the domain of component manufacturing, there is a huge potential in the arena of IoT products and solutions. The value addition of the IoT products is primarily due to the associated knowledge and the embedded intelligence. Therefore, IoT places us in a strategic niche in this respect.

The network, the IoT utilizes in the foreseen future would be the country's communication network. It is not practical to imagine the development of a separate communication network solely for the IoT. Therefore, rather than an opportunity, the network will remain at the status of an enabler for IoT. **The regulatory authorities shall ensure that the future communication network of the country is IoT friendly. It will be a paramount responsibility of the Regulator to ensure the future networks will capture the requirements of IoT, be transparent and harmonized.**

The real opportunity, Sri Lanka as a country has in the IoT is in software development. Sri Lanka is already a global player in this field. Software development is a non-resource intensive highly knowledge based and human capital centric industry. Sri Lanka as a nation with a high literacy rate has an unique opportunity in venturing into IoT based solution development and to become a strong global player in this area.

In moving Sri Lanka's economy towards a manufacturing base, IoT could be used to create factories and plants that are more efficient, compliant to international standards, and meeting sustainability criteria. Therefore, IoT could be used as the enabler for establishing the new generation of industrial facilities in Sri Lanka.

## 5.1. Strategy Objectives

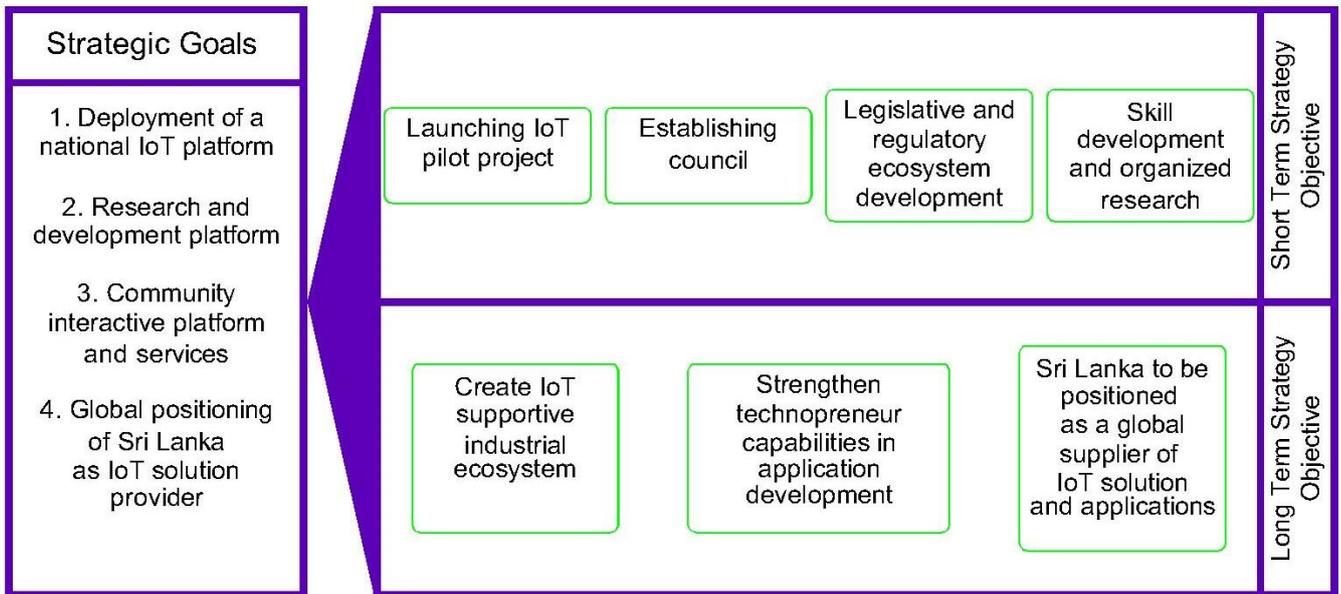


Figure 3 : IoT Strategy Objectives and Goals

It is identified that IoT is a national wide development which needs policy directives and firm strategic commitment. It is seen that device and protocol inconsistencies, non-prioritization of high impact social use cases and the unbalanced development of IoT network with analytics, have created the demand for a national IoT policy.

These strategy objectives are developed in view of reaching four ultimate goals;

1. To have a National IoT platform that is deployed over the entire country, which supports open connectivity,
2. To deploy a research platform in support and in consistent interaction with the National IoT platform in continuous development,
3. To deploy a community interactive hub which provides administrative and management services to the market,
4. To position Sri Lanka as a global service provider in IoT applications and solutions.

It may be appreciated that the country already is highly enabled with an extended capacity of software and platform development and the national development of IoT should harness these advantages effectively. Their representation in the proposed institutions by this policy would create the required synergy for the speedy development of the proposed national IoT platform.

These goals are approached through short term and long term strategy objectives. The short term strategy objectives will be developed for a strategic window of three years from 2019 to 2021. There are four short term strategy objectives identified as;

1. Establishing a Coordinating Institute, IoT Council of Sri Lanka
2. Launching pre-identified pilot projects in areas such as energy, environment, transport etc.,
3. Skills development and organized research, and,
4. Development of the legal and regulatory ecosystem,

There are three Long-term strategy objectives identified.

1. Create IoT supportive industrial ecosystem
2. Strengthen technopreneur capabilities in Application Development, and,
3. Sri Lanka to evolve as a global supplier of IoT solutions, products and applications. The exploration of strategic markets such as middle level service providers and system integrators will be the modality of entering into the global market.

The strategic framework developed in this document as shown in Figure 3 above formulates a battle plan to achieve short term strategy objectives in a period of three years and long term strategy objectives in a decade. It envisages the requirement of revising the strategic framework at least in three year intervals.

## 6. IoT: strategic framework for Sri Lanka

The IoT strategic framework has seven policy elements, in reaching the above identified long term and short term strategic objectives. These seven strategic elements are organized into three sub categories addressing environmental strategies, institutionalization strategies and the strategies related to the characteristics of the envisaged IoT platform, as shown in Figure 4 below.

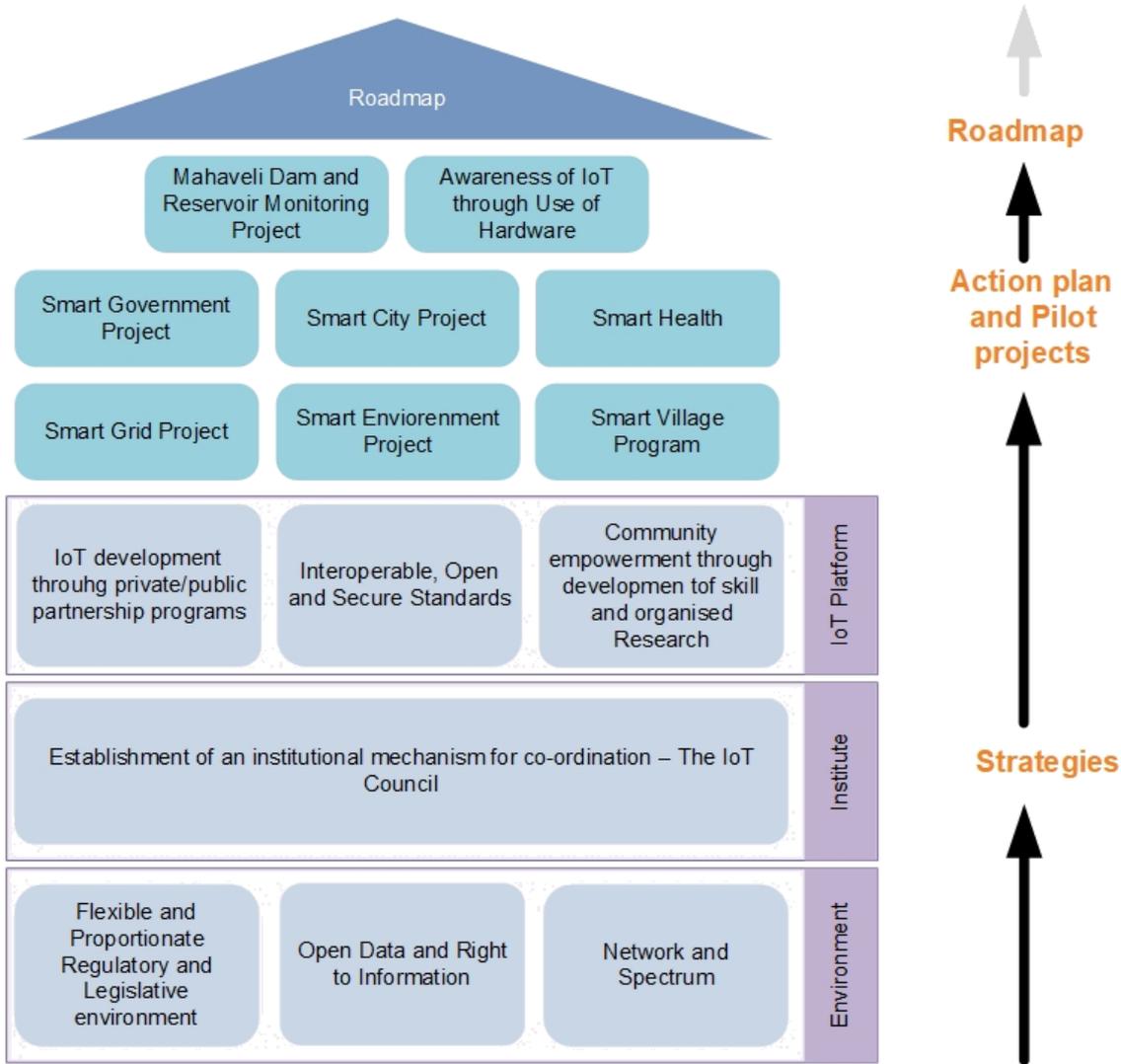


Figure 4 : IoT Strategic Framework

This strategy is pivotal around an enabling council, which regulates controls and drives the IoT development within the country. This council will comprise of the representation of industry as well as the other stakeholders and will be in the form of a statutory council. The strategic plan envisages the deployment of required breakeven data quantities to the IoT through eight pilot projects deployed as public/private partnerships. The Coordinating Council will ensure the seven strategic elements identified forthwith are strictly adhered to in these pilot projects, so that at the end of these pilot projects the country will have a scalable, interoperable, secured and well connected IoT platform to operate as the national portal.

This strategic framework is developed with the intention of deploying a vibrant IoT development community in the country with sufficient quantum of connected devices, a robust network to enable such connectivity resulting in a secure and reliable IoT platform. Our society needs to be matured to a liberal, modern and connected one through IoT. This strategy envisages such transformation to be driven through home-grown solutions and thereby to acquire skills and competencies to our industry so that our country can be positioned in the forefront of the global IT solutions market.

## 6.1. Establishment of an institutional mechanism for co-ordination – the IoT Council of Sri Lanka

The strategic framework is pivotal around an institutional mechanism setup for the purpose of **promoting rapid and orderly development** of the IoT industry in the Country. This council should have stakeholder representations from the Government, Private Sector, relevant Professional Organizations, Service Providers, Solution Developers, Research Community and Academia.

This council shall take a leading role in the community empowerment through development of skills and organized research. The council may operate as an umbrella organization in setting up directions for the development of hardware, firmware and software solution providers and in procuring wide assistance both from the government and other stakeholders.

This council shall facilitate global market access as well as global sourcing.

This council shall advise the relevant authorities on establishing a flexible and proportionate regulatory and legislative environment.

The council shall be a key player in the establishment of the open data and right to information policy of the country.

The council should be responsible for the development, standardization, security and connectivity of the IoT platform developed through the private/public partnerships.

The council shall be responsible for the implementation of the strategic roadmap proposed in this document. Therefore, the council shall establish a fully-fledged secretariat for effective co-ordination and implementation of the council's mandate.

The typical structure of the proposed IoT council is given in Annex 1.

The IoT council inter-alia shall be concerned of certain aspects such as Annex 2.

## 6.2. Flexible and Proportionate Regulatory and legislative environment

The legal system of the country should be flexible to enable the development of open data transfer while protecting the Intellectual Property Rights in the paradigm change that the IoT will bring into the society.

Data security and information protection is paramount in the development of the IoT industry. Therefore, the Relevant Regulatory Institution should ensure all time compliance of the IoT space, to public disclosed security standards. The IoT space should be secured through best practice based security protocols as well as be audited through third-party security auditors. Data protection, privacy and ethical sharing should comply with applicable international regulations and best practices.

### 6.3. Community empowerment through development of skills and organized research

The skills and knowledge required in the IoT industry should be part and parcel of the curricula starting from school education, particularly in post-primary to tertiary, vocational and university covering the entire pyramid.

The Universities and recognized research councils will be organized to a research consortium around the Coordinating Council with funding and directions to carryout local research to support the public/private partnership based IoT pilot projects identified in this Road Map. The Research consortium should be the source for homegrown enabling solutions. The research teams should take the challenge of developing solutions to support the council in its goal of successfully implementing the pilot projects using locally developed solutions.

The research effort in this regard should originate from private enterprises in addition to public research institutes.

### 6.4. Open Data and Right to Information

Public organizations should enable access to raw data that originate from their equipment and systems such as energy meters, weather data, medical laboratory data, agriculture data, vehicle traffic data, ERP based process information and transport sensory data etc. Such catalyzing data quantities would enable the enterprises to engage in the development and access to IoT. Requirement of Open Data and Right to Information shall be balanced with upholding the highest respect for the security and privacy of data while ensuring anonymity and autonomy through a national level data gate-way.

### 6.5. IoT development through private/public partnership programs

The participation of the private entities in the process of IoT development will be dependent on the immediate and short-term profitability of such engagement. As it was with the Internet, such economic breakeven will only occur at the middle stages of the development. Therefore, for the purpose of development of standards, regulations, human capital etc., the intervention of the public sector organizations will be of utmost importance. Thus, a new model for the public and private partnership in harnessing public sector stability with private sector dynamism has to be established so that the profit oriented private sector can work with the public sector in the healthy development of the IoT.

In addition, the IoT council should assist the government to identify and remove barriers for the healthy development of the industry.

## 6.6. Network and Spectrum

Network and Spectrum operate as the infrastructure for IoT. The ISPs and MNOs should be supported and promoted by the government to setup a common data portal interoperable and open source for the development of IoT.

The IoT enabling standards and methodologies should be identified by the Council and be implemented in the network infrastructure.

Service portability should be ensured such that device, network and the data consumer can interoperate without any difficulties or additional technical or administrative burden.

## 6.7. Interoperable, open and secure Standards

A freely accessible development platform should be set-up. This platform shall be affordable to all scales of developers. In and around of such IoT platform as envisaged in policy item 2, the Council should regulate and standardize each development so that a new interoperable, open and secure standard will evolve through directed open source development with due recognition to the issues pertaining to information security.

## 7. IoT Action Plan and Pilot Projects

### 7.1. Action Plan

This action plan is developed to ensure the success of short term strategy objectives within a period of four years from 2019 to 2022. By 2022 this action plan ensures that the country has moved closer to the long terms strategy objectives such that reaching these objectives by 2025 - 2030 is a reality. The IoT council shall develop the detailed action plan to implement the National Strategic Roadmap on IoT. In doing so, it is recommended to declare the IoT policy by the Government.

Table 2: Action Plan

Action		Duration	2019	2020	2021	2022
1	Establishment of the IoT Council.	2019-2020	■	■		
2	Development of university and technical colleges based open source development groups, to act as catalyst for further development and startups through initial training programs.	2019-2020	■	■		
3	Establishment of 200 school clubs through island-wide training and induction program.	2019-2020	■	■		
4	Establishment of the platform hosting infrastructure through public private partnership.	2020		■		
5	National School Curriculum revisions.	2020		■		
6	Amendment of the building code such that the interoperable BMS is mandatory for all high-rise building and large commercial establishments.	2019-2020	■	■		
7	Eight Pilot Projects.	2019-2022	■	■	■	■

## 7.2. Pilot Projects

A set of pilot projects are identified in the sectors in which substantial digitization has already taken place, so that the process data is available in digital format. Following data stream sources are identified as the candidate data for the pilot projects in view of their disruptive potential.

**a) Energy**

Smart Metering, Prepaid Electricity, Automatic Demand Response, Renewable dispatch, Streetlights

**b) Water and irrigation**

Irrigation flow monitoring, water quality monitoring

**c) Environmental monitoring**

Air pollution monitoring, water pollution monitoring, disaster early warning systems, wild life monitoring.

**d) Transport**

Traffic monitoring, parking allocations, transport ticketing, vehicle flow control

**e) Health**

Personal monitors, test report database, diagnostics, community health monitoring

**f) Buildings**

Building Automation, ADR, Renewable integration, building security, emergency warning systems

**g) Agriculture, Food supply and Fisheries**

Supply Chain monitoring, agricultural production and storage, fish population identification and monitoring.

**h) Consumer Electronics**

ADR on consumer electronics, usage pattern monitoring

**i) Administration**

Public Admin data and service portal, eProcurement, Transparency in Law enforcement and justice system

**j) Statistics**

Government statistics portal

**k) Research Data**

Transparent research data portal

**l) Education**

Creation of school level awareness and capacity building

**m) Leisure Industry**

**n) E-commerce and Retail Business**

These identified potential pilot data streams are reviewed for the readiness of the sector with the consultation of the sector experts to identify eight pilot projects as shown below.

**1. Smart Grid Project**

- a. Smart Metering,
- b. Prepaid Electricity,
- c. Automatic Demand Response,
- d. Intelligent Street light.

**2. Smart Environment Project**

- a. Irrigation flow monitoring,
- b. Air quality monitoring,
- c. Water quality Monitoring,
- d. Disaster early warning systems and Prevention,
- e. Epidemic warning and control systems.

**3. Smart Village Program**

- a. Agricultural production and storage,
- b. Supply Chain monitoring,
- c. Community health monitoring.

**4. Smart Government Project**

- a. Smart identification,
- b. Government statistics portal,
- c. Transparent research data portal.

**5. Smart City Project**

- a. Public transport flow control,
- b. Building Automation,
- c. Traffic monitoring,
- d. Parking allocations,
- e. Public transport ticketing,
- f. Smart utility supply.

**6. Smart Health**

- a. Creation of a common but personal patient medical test report database,
- b. Creation of anonymous patient database,
- c. Medical Consultation portal,
- d. Wearable device integration portal,
- e. GIS based patient tracking and alerting service.

**7. Mahaweli Dam & Reservoir Monitoring Project**

- a. Reservoir level and volume monitoring,
- b. Discharge and flow monitoring,
- c. Weather data monitoring,
- d. Gate position monitoring.

**8. Awareness of IoT through use of hardware**

- a. Improving literacy,
- b. Adaptation of new generation,
- c. Education,
- d. Awareness.

The IoT Council should carry out a detailed scoping in implementing these pilot projects in conjunction with the implementation authority.



Figure 5: Proposed IoT pilot projects



## Annex 1: Reference list

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4. Cybersecurity and the Internet of Things by Ernst & Young Company
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8. The Internet of Things; Time for a National Discourse by Information Technology Association of Canada (ITAC)
9. Realizing the Potential of the Internet of Things: Recommendations to Policy Makers 2015 by Telecommunications Industry Association of Arlington
10. The Internet of Things by International Telecommunication Union
11. Securing the "Internet of Things" Survey by John Pescatore
12. The Digital Economy- Opening up the Conversation by IoT Alliance Australia
13. Advanced Manufacturing: A Roadmap for unlocking future growth opportunities for Australia by CSIRO Futures of Australia



## Annex 2: List of stakeholders

1. British Computer Society (BCS) - The Chartered Institute for IT
2. Central Bank of Sri Lanka (CBSL)
3. Central Environment Authority (CEA)
4. Ceylon Chamber of Commerce (CCC)
5. Ceylon Electricity Board (CEB)
6. Civil Aviation Authority (CAA)
7. CodeGen International (Pvt.) Ltd.
8. Computer Society of Sri Lanka (CSSL)
9. Department of External Resources (ERD)
10. Dialog PLC.
11. Disaster Management Centre (DMC)
12. Federation of Information Technology Institutions Sri Lanka (FITIS)
13. ICT Industry Skills Council Sri Lanka (ICTISC)
14. Information and Communication Technology Agency (ICTA)
15. Institution of Engineers, Sri Lanka (IESL)
16. Intelligent Solutions and Consultancy (ISaC)
17. Internet Society Sri Lanka Chapter (ISOC)
18. Lanka Electricity Company (Pvt.) Ltd. (LECO)
19. LTL Holdings (Pvt.) Ltd.
20. Ministry of Agriculture
21. Ministry of Defense
22. Ministry of Digital Infrastructure & Information Technology
23. Ministry of Education
24. Ministry of Health, Nutrition & Indigenous Medicine
25. Ministry of Irrigation & Water Resources Management
26. Ministry of Mega-polis & Western Development
27. Ministry of Power, Energy & Business Development
28. Ministry of Public Administration & Disaster Management
29. Ministry of Public Enterprise Development
30. Ministry of Transport & Civil Aviation

31. Mobitel (Pvt.) Ltd.
32. MTV/ MBC Networks (Pvt.) Ltd.
33. National Engineering Research and Development Centre of Sri Lanka (NERDC)
34. National Institute of Education (NIE)
35. National Transport Commission (NTC)
36. Peoples Bank
37. Sampath Bank PLC.
38. Singer Sri Lanka PLC.
39. Sri Lanka Association of Software and Services Companies (SLASSCOM)
40. Sri Lanka Computer Emergency Readiness Team (CERT)
41. Sri Lanka Export Development Board (EDB)
42. Sri Lanka Institute of Nanotechnology (Pvt.) Ltd. (SLINTEC)
43. Sri Lanka Railways
44. Sri Lanka Sustainable Energy Authority (SLSEA)
45. Sri Lanka Telecom (SLT)
46. Sri Lanka Tourism Development Authority (SLTDA)
47. Telecommunications Regulatory Commission of Sri Lanka (TRCSL)
48. Urban Development Authority (UDA)
49. Virtusa (Pvt.) Ltd.
50. WSO2 Lanka (Pvt.) Ltd.
51. Zone24x7 (Pvt.) Ltd.

## Annex 3: Proposed Structure of Council

Representations from following institutions have initially been identified for the IoT Council.

1. Ministry of Digital Infrastructure and Information Technology- Chair
2. Ministry of Policy Planning
3. The Institution of Engineering and Technology Sri Lanka Network (IET Sri Lanka Network)
4. Department of Computer Science & Engineering, University of Moratuwa (UoM)
5. Department of Electrical & Electronic Engineering, University of Peradeniya (UoP)
6. Department of Electrical & Information Engineering, University of Ruhuna (UoR)
7. Information and Communication Technology Agency (ICTA)
8. Telecommunication Regulatory Commission (TRC)
9. Computer Emergency Readiness Team (CERT)
10. Computer Society of Sri Lanka (CSSL)
11. Federation of Information Technology Institutions Sri Lanka (FITIS)
12. Sri Lanka Association of Software and Services Companies (SLASSCOM)
13. The Institution of Engineers, Sri Lanka (IESL)
14. Dialog PLC.
15. Sri Lanka Telecom (SLT)
16. Mobitel (Pvt.) Ltd.
17. Ministry of Education
18. Ministry of Health, Nutrition & Indigenous Medicine
19. Ministry of Agriculture
20. Department of Immigration and Emigration
21. Ceylon Electricity Board (CEB) & Lanka Electricity Company (Pvt.) Ltd. (LECO)
22. Mahaweli Authority of Sri Lanka
23. Urban Development Authority (UDA)
24. WSO2 Lanka (Pvt.) Ltd
25. CodeGen International (Pvt.) Ltd.
26. Zone24x7 (Pvt.) Ltd.
27. N\*Able



## Annex 4: Stakeholder concerns to be addressed

Stakeholders have proposed that following concerns shall be addressed as a priority since they may otherwise be a hindrance to the proper implementation of the IoT in Sri Lanka.

1. Restrictions imposed by the TRC during the times of insurgencies are creating major impediments to industrial growth. Therefore, telecommunication regulatory regime and controls imposed by the Defense ministry for the equipment and frequency domain control need to be re-visited and re-evaluated within the context of the expected rapid digital technological growth.
2. The design-to-market product life cycle had been largely extended due to the delivery constraints of electronic components. Therefore, incubatory electronic component storage should be maintained for the access of small scale electronic industrial enterprises.  
Incubatory infrastructure such as 3D printing, rapid prototyping and PCB manufacturing should be made available for developers at easy access and affordability.
3. Inadvertent delays take place during Customs clearance due to the high technological nature of components used in the IoT Industry. Therefore, it is proposed to introduce a special Customs window with the help of the Computer Science and Engineering Department of the University of Moratuwa or capacity building within the Department of Customs itself (which will take a considerable time).

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