ADMINISTRATIVE REFORMS COMMISSION

GOVERNMENT OF KERALA

ELEVENTH REPORT

e-GOVERNANCE
- FOR BETTER GOVERNANCE

JANUARY 2021

Foreword

Kerala is a forerunner in reforms in education, socio-cultural and governance aspects, in the country. The state pioneered implementation of people centered e-Governance projects to improve performance, efficiency and quality of service delivery. Literacy, education, socio economic aspects and people centric development created strong foundation for people to use and adopt Information Technology. Telecom and internet infrastructure, along with digital literacy facilitated communication and transaction through internet and mobile phones. Internet and mobile usage in state increased multifold and people across social strata moved to digital transactions during Covid-19 pandemic. It is reported that Kerala secured first rank, with the greatest number of e-transactions for state and civic body services during the lockdown, followed by Gujarat.

e-Governance assist government in better implementation of major features of good governance - rule of law, participation, transparency, efficiency, equity, accountability, responsiveness, consensus, inclusivity, people friendliness and accessibility, by building trust between government and the people through internet based strategies to involve people in policy process and ensuring transparency and accountability of government.

e-Governance in India came to centre stage with introduction of National e-Governance Plan (NeGP) in 2006. However, even before introduction of NeGP Government of Kerala implemented many people centered e-Governance projects that served to improve performance, efficiency, quality of public service delivery and better utilisation of limited resources. Akshaya project, set up in 2002 to address backwardness of Malappuram District in Kerala is the first e-Governance project in India and was instrumental in transforming the district into India's first e-Literate district. Kerala also has to its credit the setting up of the first technology park in the country- Techno Park in 1990.

However, despite the initiatives and investments made in this sector the state could not sustain the initial momentum it achieved in e-Governance. In this report the Commission has studied existing IT infrastructure, effectiveness of implementation e-Governance projects, issues in delivery of services, along with the eco system that drives e-Governance in the state. Based on the study, recommendations for improving delivery of people centric services and bring e-Governance closer to people are included in the report.

Wide spread adoption of internet and mobile phones has led to increase in crimes involving financial transactions, personal data and privacy, defamatory attacks- especially to women and children, even after initiatives by police, RBI and the banks to address the issues. Government and the civil society need to take more proactive measures for safe guarding the vulnerable sections during the roll out of ICT solutions.

Effective and successful implementation of e-Governance/ICT projects in departments/ institutions is the responsibility of all officials from top to bottom and not to be seen as a project implemented by one section / wing. e-Governance brings in paradigm shift in governance systems. It is a continuous process and requires many changes in centuries old government processes and legal framework. Acts and Rules needs to be amended / reformed based on prevailing socio economic conditions, change in technology, present requirements and expectations of the people. The spirit that 'e-Governance is a journeyand not a destination' needs to be engrained in the psyche.

In the 11th report of second ARC, Government of India - 'Promoting e-governance: The smart way Forward', the need for re-engineering administrative processes and re- organisation of information ownership are cited as important steps for implementing e-Governance applications. The report goes on to add " Government entities would be required to implement substantive reforms in organisational structures, initiate a change in culture and mindsets, train and improve skills of its people and put in place appropriate supporting ICT infrastructure to enable online processes that are timely and efficient for both the government entity and the entities it interacts with".

Government needs to adopt emerging technologies like Artificial Intelligence, Internet of Things, Blockchain, Data Analytics etc. for transforming governance systems. Government also needs to take suitable measures to ensure inclusion of the vulnerable and marginalised sections of the society while adopting ICT technologies. Introduction of ICT shall not lead to further marginalisation of these groups. I also request government to promote use of 'open source software' in all e-Governance, related applications.

I take this opportunity to thank all persons and organisations that assisted in the study and requests government to study the report and implement the recommendations to bring administration/governance closer to people.

V.S. Achuthanandan M.L.A.

25..01.2021
Thiruvananthapuram

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List of Abbreviations

AePDS ……...Aadhaar enabled Public Distribution System

AMC …….....….Annual Maintenance Contract

API ……...…Application Programming Interface

AI ...……..……..Artificial Intelligence

BHQ ……..……..Block Head Quarters

C-DAC ...…….... Centre for Development of Advanced Computing

C-DIT ……..…Centre for Development of Imaging Technology

CSC …….…….……Common Service Centres

CT ……...……..…….....Computed Tomography

DPR ……..……...Detailed Project Report

e-Governance ……..…….....Electronic Governance

EHR ……..Electronic Health Record

E&ITD ……..…..Electronics & Information Technology Department

EoI …….….Expression of Interest

FMS ……...…….Facility Management System

FHC …….……....Family Health Centers

FRIENDS …….....Fast Reliable Instant Efficient Network for Disbursement of Services

FRS ……..……..…...Functional Requirement specification

GoI …….……...……...Government of India

GPR ……..……...Government Process Reengineering

G2B ……..…….……Government to Business

G2C ……..……Government to Citizen

G2E ……..……Government to Employee

G2G ……...…...Government to Government

HMS …….……..…..Hospital Management System

CERT-In ……...Indian Computer Emergency Response Team

ICT …….……....Information and Communication Technology

IKM …….……..…..…….Information Kerala Mission

ICCC ……...…….Integrated Citizen Call Centers

IDSP ……....Integrated Disease Surveillance Programme

IFMS …….……..…...Integrated Financial Management System

IPR ……...…….Intellectual Property Rights

KFON ……...……..Kerala Fibre Optics Network

KSITM ……...….Kerala State Information Technology Mission

KSWAN ……..……...….....Kerala State Wide Area Network

LAN ……...……..Local Area Network

LSGIs ……...Local Self Government Institutions

MRI ……..….Magnetic Resonance Imaging

MCH ……..…..…..Medical College Hospital

MoU ……..Memorandum of Understanding

MeitY .....…….Ministry of Electronics and Information Technology

MVD …….....……..……..……..Motor Vehicles Department

NDC ……..……..National Data Centre

NeGP ……..……..National e-Governance Programme

NIC …….……..National Informatics Centre

NLEP ……..National Leprosy Eradication Programme

NPCB …….....…….....National Programme for Control of Blindness

NPCDCS …….....National Programme for Prevention and Control of Cancer, Diabetes, Cardiovascular Diseases and Stroke

NTEP ……...…...National Tuberculosis Elimination Programme

NVBDCP ……...…....National Vector Borne Disease Control Programme

NDA …….....……Non-Disclosure Agreement

P&ARD …….....Personnel & Administrative Reforms Department

PII ……..……...Personally Identifiable Information

PACS …….....Picture Archival and Communications System

PHCs ……..…….....Primary Health Centers

RFP ……..…Request for Proposal

RTI ……..….Right to Information

SPARK ……..……...Service and Payroll Administrative Repository for Kerala

SLA ……..……Service Level Agreement

SMART ……..…….Simple, Moral, Accountable, Responsive and Transparent

SOP ..……...……..Standard Operating Procedure

SDCs ……..…….....State Data Centres

SeMT ……...……..……State e-Governance Mission Team

SSDG …….....State Service Delivery Gateway

SAN …….....…..Storage Area Network

TRAI …….……...…….Telecom Regulatory Authority of India

TSP ……..…...……..Total Solutions Provider

UMANG ……Unified Mobile Application for New-Age Governance

UHID ……..……Unique Health Identification

Contents

Executive Summary

Electronic Governance (e-Governance), for delivering government services through online mechanisms in a transparent, equitable, efficient manner to various stakeholders have gained considerable significance over the last decade. Emergence of e-Governance in public service delivery has resulted in improving transparency and accountability in delivery of services along with reduction in cost of delivery of services and increase in revenue. Kerala has been in the forefront of implementing e-Governance programs even before introduction of National e-Governance Programme (NeGP), and State Mission Mode Projects by Government of India . The state is one of the earliest movers in setting up own Data Centre, before institution of State Data Centre scheme under NeGP. Mobile phone and internet penetration in the state is higher than that of many other states. Akshaya citizen service center project started by Kerala as part of digital literacy program is replicated by many other states in the country and internationally.

Availability of IT infrastructure facilitated achievements of Kerala in the field of e-Governance. But the state could not build on the initial advantage and keep up the momentum.

Departments of the State exhibit apparent variations in both the extent of implementation of e-services and in efficiency of running the system. Services of most of the departments which provide services directly to the people are available online. Some departments have extended their services to mobile platforms while others have been lethargic in migrating to e-platform. Several lacunae are recognised in the existing e-Governance system and needs to be addressed for improving efficiency of the system and enhance convenience of the people in availing the services.

e-Governance generates enormous amount of data, most of which are personal, sensitive and critical. *Privacy* and *security* form an integral part of collecting, generating and management of data related to people, businesses and government.

Success of e-Governance services depends mostly on the value attached to it by the public, and include peoples' perceptions, attitude and awareness about the system, along with the rate of digital literacy, access to internet, mobile penetration etc. Common Service Centres (CSC) like Akshaya Centers have significant impact in the success of the schemes. Any e-governance system needs to be designed keeping people as its focal point and how they will be benefitted by implementation of this system. The issue of design-reality gaps needs to be addressed through better understanding of end-users' requirement. The Commission studied efficiency of delivery of online services through e-district project, and e-Health project to understand various aspects of e-governance, and study issues and constraints faced by people in availing benefits of e-Governance. Process evaluation of both projects was conducted through qualitative semi-structured interviews. e-District is chosen for the study as it is used by most of the people who seek government services and is facilitated by the CSCs. e-Health project does not have direct interface with people, as in the case of e-District but is intended to enhance quality of health services provided. Under this project required changes in the nature of service delivery are to be initiated by the Medical Officers and other staff of the health centre.

Intended as an evaluative report for reform recommendations, the report focusses mainly on improvements essential for ensuring robustness and ability to adapt/change, of e-Governance system in the state. ARC identified few impediments in smooth implementation and ensuring user friendliness of e-Governance solutions from interactions with the departments and field surveys. Recommendations are formed based on these findings. Some of the concerns, like risks due to data integration need to be addressed at a broader level as ethical questions. Many of the issues could be sorted out through changes in technological front and administrative procedures. Public value for e-Governance is quite high in the State and by addressing the challenges the State can

achieve the goal of ensuring efficient, transparent, cost-effective, and reliable services to the stakeholders.

Introduction

Kerala is a pioneer among the Indian states in implementation of e-Governance. The state remains a success in retaining essential features of good governance - rule of law, participation of people, transparency, efficiency, equity, accountability, responsiveness, consensus, people friendliness and accessibility, even when it switched over to e-Governance. To achieve a people friendly, just and transparent civil service and to ensure accountability, speed and accuracy, it is essential to use ICT and aligned technologies efficiently. The merits of e-Governance are - providing various government services with transparency, effective interaction between the government and the public, people empowerment by enabling information dissemination, alleviation of corruption, reduced expenditure on governance and, overcoming delay in providing various government services.

Kerala State IT Mission, Information Kerala Mission, FRIENDs Janasevana Kendras, Akshaya Centres etc. are milestones in the state e-Governance mission. e-Governance has journeyed and evolved through many phases and has reached the threshold of m-Governance, but it has to be evaluated whether benefits of e-Governance has reached all. The commission has studied whether inclusion of all people is assured when governance shifts to e-Governance.

The era of e-Governance started in the State of Kerala during the year 1999 with the establishment of Kerala State IT Mission (KSITM) and Information Kerala Mission (IKM). The Electronics & IT Department is the Nodal Department for taking decisions in e-Governance and ICT. Kerala State IT Mission is the nodal agency under Electronics & IT Department for facilitating and implementing e-Governance projects in all departments. Information Kerala Mission act as a nodal agency under Local Self Government Department (LSGD) for implementing e-Governance projects in Local Self Government Institutions (LSGIs).

e-Governance comprises of the following services by government:

- Government to Citizen (G2C)
- Government to Business (G2B)
- Government to Employee (G2E)
- Government to Government (G2G)

Better and transparent delivery of government services to the public, efficient and fruitful interaction between government and the people, better dissemination of information, curbing corruption through increased transparency and accountability, savings through reduction in costs, increased revenue collection and faster service delivery are major and apparent advantages of e-Governance.

However, lack of interoperability between various Government agencies, design flaws, lack of awareness among people, fear of cyber-crimes and data privacy are major reasons for limited acceptance of e-Governance. Apart from these common problems, developing countries face more obstacles in implementing an efficient e-Governance system. Number of studies have indicated that a major share of the e-Governance projects in developing countries have not achieved the desired results . It often seen that project designs chosen for schemes sometimes fail during field level implementation leading to design - reality gap. Better understanding of design-reality gap and causes for the same will enable rectification of defects and assist in developing more efficient designs to cater to the needs of users. Few examples of design-reality gap that defeated the purpose of e-Governance are:

- MVD Application: After applying online for a service through the MVD application the applicant needs to visit the office of Motor Vehicles Department with print out of the application submitted online and wait in long queues to avail the service. Many times, people have to depend on middle men to get the service on time due to necessity of multiple visits, lack of clarity in procedures, complexities in availing services.

- e-District: There is provision in the e-District portal for a person to apply directly for certificates. But it is seen that only less than 5 percent of Certificates are availed directly due to complexities in the e-District portal. Lack of user friendliness in the design of e-District portal including complex process associated with submission of supporting documents, compels people to apply through Akshaya Centres.
- OPEN PEARL Application: Registration of land in Kerala is done through 'Open PEARL' application of Registration Department. There is provision in the application to prepare document directly by a person and apply for e - registration of deeds. But it can be seen that so far less than 2 percent of registrations are done utilising this provision. This is due to complexities in the 'Open PEARL 'application. Effort has not been taken so far to address issues faced by of people for registering documents directly.

The Kerala State Right to Service Act (2012) stipulates efficient and time-bound delivery of services and redress of grievances by government. Provisions of the Act also make government servants liable in case of deficiency in service. Effective and efficient e-Governance systems are essential to achieve/ implement provisions of the Act. Timeframe specified in the Act is based mainly on manual workflow / file flow and needs to be amended based on delivery of services electronically. Awareness among people and use of provisions in this Act is exceptionally low compared to RTI Act.

This report evaluates e-Governance system in the state through two angles: i) functioning at the state department level and ii) from people' perspective. The former can be broadly seen as service providers and the later includes both people and facilitators like Common Service Centres.

Objectives

- To review the role and the functioning of Electronics & IT Department, Kerala State IT Mission, Information Kerala Mission and Total Solution Providers.
- Examine the process efficiency of e-Services provided by various departments.
- Assess the extent of accessibility of e-Governance services and study whether some groups of individuals are further marginalised due to complexities in availing e-Governance services due to lack of required education and skills.
- Evaluate the impact of e-Governance services in terms of improving accountability and transparency in the system.
- Recognize impediments in the system and recommend possible solutions for improvement of the system.

Methodology

- Interview and data collection from the Nodal Agencies, Departments, Total Solution Providers, People, Employees and other stakeholders. (List is at **Annexure-I**)
- Exploratory Study
- Field survey
- Opinion from the expert groups
- Conducting workshops etc. (Executive summary of the National Seminar conducted by the Commission is at **Annexure-II**)

Structure of the report

The report includes Executive Summary, Introduction, four chapters and a concluding chapter. First chapter analyses departmental and institutional framework of e-Governance in the state. Second chapter is on issues of e-governance infrastructure. Concerns about data security and privacy related to e-Governance is dealt in the third chapter and fourth chapter is on perception of people and facilitators on e-governance, focussing on e-District and e-Health projects.

ICT has penetrated into our lives in various ways during this pandemic period . It is sure that in the post pandemic world it will play a much greater role in our lives, provide a variety of services and open before us a world of infinite possibilities of e-Governance and m-Governance. Our e-governance systems should be modernised to leverage the use of ICT in a big way to improve the standard of life of the people.

Chapter 1

I. e-Governance Framework and Present Status

Adoption of e-Governance is resorted to make governance easier than in the conventional systems and is to be implemented by all Departments in the state. Existing institutional framework needs an overhaul, and roles of the organisations need to be redefined . Some of the issues in the institutional framework of e-Governance in the state are discussed here.

1. Role and functioning of Nodal Agencies

a. Kerala State IT Mission

Kerala State IT Mission (KSITM) is an autonomous Agency functioning under Department of Electronics & Information Technology, Government of Kerala. It was established in the year 1999 as per GO (Ms) No. 43/1999/ITD dated 23.03.1999. Vision of KSITM is to make Kerala a digitally inclusive state in India through robust and effective governance frame work. KSITM aims to promote digital innovations and make Kerala knowledge driven and knowledge powered digital state.

Objectives of KSITM are:

i. Transform relationship between citizens and the State - giving more power in the hands of citizens and being more responsive to their needs.

ii. A robust and effective governance framework in place to ensure that our values, people, systems, processes and resources are aligned to secure the best possible outcomes for ICT.

iii. High-impact services that improve citizens' quality of life in a digitally Smart State.

iv. Deliver services that comply with all major attributes of e-Governance viz. Simple, Moral, Accountable, Responsive and Transparent (SMART).

v. A comprehensive framework covering service delivery, open government and ICT operations.

vi. To improve public sector productivity through the effective management of ICT.

vii. Aspires to develop and flourish through innovation and constant development of ICT in the pursuit of a progressive, socially inclusive, safe and secured Kerala.

b. **Information Kerala Mission**

Information Kerala Mission (IKM) is a pioneering e-Governance project set up by Government of Kerala for computerisation of Local Self Government Institutions of Kerala in 1999 as per GO(Ms) No. 38/1999/Plg dated 12.08.1999. IKM was registered as an autonomous body under the Travancore - Cochin Literary, Scientific and Charitable Societies Registration Act, 1955 as per G.O(Rt) No. 343/2012/LSGD dated 22/12/2012, on 10th February 2014. e-Governance programs of the Mission include developing software for efficient and responsive systems for smart governance and improving public service delivery with comprehensive citizen interface covering various activities of Local Self Governments.

Objectives of Information Kerala Mission are:

i. Transform local bodies into effective institutions of self-governance by providing transparent, efficient and responsive mechanisms for governance and citizen service delivery at local bodies in a time bound manner.

ii. Develop synergies with local ICT institutions to involve them in strengthening such e-governance initiatives.

iii. To establish a mechanism for automating and monitoring various operations at the local body level like plan monitoring and management, accounting, finance, public services, purchase, works and other e-Governance related tasks, thereby making a quantum leap in accountability, transparency and efficiency in public service and considerably strengthening the social security network.

iv. Improve revenue generation, resource identification and utilization capabilities of local bodies and provide inputs to bring about substantial administrative reforms and modernization of government through re-engineering of business processes.

v. To provide continued technical support to ensure network applications are up and running throughout, through district / state level help desk.

The Commission reviewed roles, responsibilities, functioning etc. of the above two organisations. At the initial stages of formation both the organisations achieved remarkable achievements in e-Governance. But later on, performance of these organisations could not meet expectations of government and people and led to stagnation in conceptualisation, development and implementation of e-Governance projects in the state.

c. Issues

i. Majority of staff working in both the organisations are not selected based on professional excellence and they are not provided opportunities to update their skills in recent technological advancements. Absence of an incentives structure for employees is another issue. For example, there has been no hike in emoluments of employees of KSITM since 2016 making it difficult to retain skilled persons.

ii. Officials of Nodal Agencies who are responsible to drive innovations in e-Governance are often unable to do so and falls short of meeting expectations of

government and the people. Professional training and technology upgrades of the officials is not in tune with fast paced technological advances in ICT domains.

iii. Lack of timely review of performance of the organisations, its officials and projects by Government leads to inefficiencies in their functioning. Both organisations are deficient in conceptualising, developing and implementing new e-Governance projects. International and National best practices are not analysed for customisation and adoption in the state. Last few years have not seen any new innovative e-Governance applications launched by these organisations.

iv. Local Self Government Institutions (LSGIs) are still using obsolete technology and applications like Sankhya, Sanchaya, Sulekha, Sevana, Sanchitha, Sthapana, Soochika etc. developed in the 90's. They are standalone applications and IKM has not succeeded in integrating them or developing new comprehensive application integrating all requirements of all the LSGIs. IKM has developed and implemented an Integrated Local Governance Management System recently to deliver online more than 200 services of LSGD, to people. But as of now it is implemented only in 150 LSGIs. Feedback on integration requirements, user friendliness, adaptability, etc. of the system is yet to be analysed.

v. Applications designed years back like e-District, SPARK, e-Procurement etc. are still being used in government departments and are facing obsolesce. KSITM is yet to take any earnest efforts to develop state of the art applications to replace/retire these obsolete applications to meet present requirements of the departments and expectations of the people. People face constraints/difficulties in submitting applications directly through e-District portal, without the support of Akshaya Centres. This is primarily due to lack of user friendliness of the application. This is evident from the percentage of applications submitted directly by persons as compared with the applications submitted through Akshaya centers.

vi. Institutions like C-DIT has less than 100 software developers in a staff strength of about 600 showing skewed policy in recruitment to technical institutions.

vii. Organisations like NIC which developed e-Office, e-District, e-Procurement etc., has not developed competency to deal with emerging technologies like Blockchain necessitating availing services from start ups and organisations like K-DISC, CDAC etc.

viii. Dissatisfaction of departments with competency of resource persons assigned to them for supporting e-Governance projects is also an issue at times.

2. Departmental issues in execution of e-Governance projects

The Commission held several rounds of discussions with all major Departments who are frontrunners in implementation of e-Governance initiatives, Some of the Department level issues in implementation of e-Governance are:

i. The departments exhibit extreme variations on the extent to which they have shifted their services to online modes.

ii. Some of the departments have done better than others in this aspect and provide efficient and faster service to the people. These 'progressive' departments have made access to services easy for the end user by making available most of their services online, accessible through the web, and some of them even extending access to a large array of their services through mobile applications.

iii. On the other side some of the departments have taken very little efforts to make their services online. From a study of the services provided by these departments, it can be seen that many of the services can be easily made available online.

iv. Progress of State Mission Mode Projects under NeGP in Agriculture, Employment, Health, Land Records etc. is years behind the original date of completion. Land Records project has not made any significant achievement in the state and people still face many issues related to Land Records. The agency entrusted with implementation of the Land Records Project in the State is still experimenting with various models and pilots for many years, bringing almost to standstill the project for digitisation of Land Records which was started in early 2000s as part of Modernisation of Government Programme. Meanwhile many states have made remarkable progress in Land Records modernisation and have achieved the objective of providing conclusive land title. The Commission has included issues related to management of Land Records and made recommendations in its 5th Report "Towards People Centric Service Delivery".

v. In some of the departments like the Motor Vehicles Department, though a large number of services are available online, after doing all the necessary procedures online the end user still has to visit the office thus negating the purpose of e-Governance. With the implementation of 'Vahan Sarathi' by Government of India there are improvements in online services, but still there is a long way to go. These issues are a direct result of rules not being in sync with IT innovations and is common in the case of departments where e-Services are introduced without amendment to rules.

vi. Lack of user friendliness of most of the applications developed by the departments make it extremely hard for people to use and understand them. Some of the departments are not concerned about this and no notable effort is seen taken by them to make the applications more user friendly. For example, while applying for an online service, most of the applications specify file size, type and image resolution for attachments that has to be uploaded along with the application and the system validates thereafter . If there is any mismatch in

the documents uploaded, the person will not be able to proceed with submission of the application and have to depend on Akshaya centre or other facilitation services. There are tools available which could be integrated to the applications to address these issues. There is provision in the e-District Portal to apply directly for a certificate, by people. But the percentage of such applications submitted, and certificates issued are less than 5. This is due to the complexities in the obsolete e-District Portal.

vii. These flaws can be attributed to lack of interest or technical competency of the departments and service providers. But there is a class of services which cannot be made 100% online as manual inspections and interventions are essential. For example: to ensure fitness of a vehicle the vehicle needs to be produced before the Motor Vehicle Inspector until automated vehicle testing systems are in place. For registration of land, the buyer and seller have to be present before the Sub Registrar and has to sign the document in the presence of the Sub Registrar.

viii. The Departments of the state thus show wide variations in the e-readiness index with respect to implementation of their services online.

3. Dependency of Departments on Total Solution Providers

The Commission has also observed following points during interaction with the departments and Total Solution Providers (TSPs):

i. One of the major constraints noted during discussions by ARC is the lack of technical competency of the departments. Only a few departments have qualified technical persons who can function as business analysts and has awareness of technology, technical solution process and management of e-Governance applications to provide services online to the people.

ii. Majority of e-Governance projects are implemented with the support of National Informatics Centre (NIC). During interaction of the Commission departments raised the issue of rigid attitude and approach of some of the project heads of NIC which is hindering departmental initiatives. An organisation like NIC needs to provide agility and innovative approaches for development of e-governance projects, but many times are found to be more rigid in their attitude over the software development life cycle of the project. At the same time, it is not feasible to plan a transformation journey without involvement of organisations like NIC.

iii. Due to the lack of technically qualified in-house personnel, the departments are compelled to depend on TSPs or private enterprises for development of software applications and its management. Most of the departments identified one or more of the TSPs listed by the government to develop and manage their applications. It is highlighted by most of the departments that deliverables of the TSPs is not in line with actual requirement of the departments. It is observed that many times departmental initiatives in e-Governance are handicapped by lack of competency and sluggish attitude of the TSPs.

iv. Departments prefer to award e-Governance projects to TSPs as procedures for entering into contracts with TSPs empanelled by the State Government are simpler than that for private service providers. This has negative impact on efficiency of the departments to deliver optimum services at competitive cost to the people.

v. State Mission Projects where KSITM used to get funds from Government of India have almost come to an end and departments now get funds directly from budget heads or through special projects. Hence, they prefer to bypass KSITM in the selection of TSPs except to get mandatory remarks/approvals.

vi. There are always gaps in communication between departments and TSPs. The main reason for this is lack of technical knowledge of the department and domain knowledge of TSPs. This reduces the success rate of e-Governance applications. IT Nodal Officer (if there is no other qualified resource person) maybe trained on SDLC, UI/UX, Business Analysis, Technology Awareness. Government Staff trained in PGDeG needs to be mandatorily positioned as Nodal Officers irrespective of their rank and position in the department.

vii. TSPs outsource a part or whole of the application development to external agencies / developers in most of the cases. Actual requirement of the departments is not reflected in the deliverables due to this outsourcing. This requires frequent request for modifications / updating by the end user. Since the TSPs outsource the project to third parties / contract employees and most of them leave after development of the software there is a lack of business continuity planning. Project management repository or a proper version control system for the software projects are not seen implemented in any of the projects implemented and as a result TSPs struggle to modify / update the application as per the requirement of department. Some of the departments have abandoned projects because of this.

viii. There are scenarios in which TSPs piggyback private vendors to market their third party solutions to departments. This negates the concept of TSPs, and departments end up with products and solutions not as per their requirements and ultimately adversely affecting service delivery to people/ stakeholders.

ix. In most cases there is no Service Level Agreement (SLA) and penalties covering deliverables, time frames, and performance of applications delivered by TSPs are not clearly defined, thereby departments end up in a disadvantageous situation after spending considerable amount of money and time.

x. Annual Maintenance Contract (AMC) is not entered with TSPs for products and services at the time of purchase, many times. So, after the warranty period, maintenance and services are sometimes not available and departments are not getting optimum value for the money they have spent, in extending the serviceable life.

4. Data sharing

In most of the cases state-owned applications are developed and implemented by the TSPS like NIC, C-DIT, Keltron etc. Intellectual Property Rights (IPR) of the application and ownership of data is to be vested with the concerned department. But in reality, this is not being done in most of the cases. Even though the departments pay substantial amount to the TSPs for development of an application, the TSPs do not share source code to the Department for accessing data. This creates issues related to sharing of data with other Government departments for providing integrated services. The commission has noticed following issues regarding data management and sharing:

i. The departments are at the mercy of Solution Providers for data management. Data owned by majority of departments are practically administered by the Solution Providers or their employees.

ii. The same set of data collected from individuals / households can be used by a number of departments. At present the scope of sharing the data collected by one department with another department is difficult, even when there are government directions to share data with other Departments for delivering integrated services to people. There are two reasons for that:

a. TSPs especially NIC is not ready to share the data with other Departments even after specific written direction from the department concerned. The Motor Vehicle Department illustrated their experience in sharing data for the integration of two applications developed by NIC and C-DAC.
b. Lack of coordination between the Departments - who needs data and who owns data. Many times, departments are also reluctant to share data even with other departments.
c. Lack of API driven architecture, the legacy departmental applications which are developed over various time periods does not have API interfaces, nor the State has come up with API sharing policy.

iii. Some of the departments are unaware that IPR of the developed application and data collected belongs to government.

5. Duplication of Software Application and ownership of source code

As per GO (P) No. 24/2009/ITD dated 29.09.2009, IPR of software applications are vested with government and if similar requirement arises from any other department the same application needs to be shared with that department. The commission observed following issues regarding duplication of software applications and ownership of source code.

i. Even though source code of applications developed are to be transferred / handed over to the department concerned, it is not happening in most of the cases. In the case of most of the applications, developers / TSPs have not handed over source code along with documentation to the departments. This makes it difficult for another solution provider to update / upgrade and do maintenance of the applications as required by departments. In such cases, the Department has to approach the same developer for any modifications and updating, even if their services are not satisfactory.

ii. Technical inadequacies and lack of interest shown by owner department in receiving the source code and absence of secured infrastructure facilities for maintaining the same are other reasons for not transferring source code.

iii. At present, there is no mechanism to monitor development/procurement of similar applications by different departments. Some departments bypass concurrence of Electronics & IT Department and advice of Kerala State IT Mission for development of applications. Departments end up developing separate software even when similar software is available with other government departments. This can be due to following reasons:

   a. Lack of availability of data regarding inventory of applications used by various departments in a centralised repository.
   b. Constraints in retrieving source code and permissions from owner departments and support from the TSPs associated with the development of the applications.
   c. Deficiencies in monitoring and support from KSITM, the nodal supervising agency. Failure by KSITM to take stock of applications across departments and communicate to the client departments availability of similar/adaptable applications in government domain.

iv. These reasons have led to duplication of a large number of applications in the public domain, and lack of proper access to the source code have resulted in development of large number of stand-alone applications that cannot be integrated with requirements of other departments.

v. Some of the TSPs sell same applications developed for a specific department to multiple departments with peripheral modifications and collect exorbitant amount from each department. This is an avoidable leakage from public exchequer. Software reuse policy is clearly laid down by MeiTY and ha sestablished ‘Open Forge’ for its implementation. In practice there is no reuse

of software in the state. It is observed that some start ups sell the same products to many departments after building necessary wrappers.

6. Technical constraints related to infrastructure

At present, there are two Data Centres in the State (SDCs) and there are more than 1500 websites / web applications hosted in these two SDCs. In terms of connectivity the state has Kerala State Wide Area Network (KSWAN) connecting up to Taluk and Block level. Remote offices are connected through leased lines, wireless and LAN connectivity etc. The present infrastructure at SDCs and KSWAN is not sufficient to cater to the needs of e-governance requirements of the State. The issue will be dealt in a great detail in Chapter 2.

7. Bandwidth and Network related constraints

The issue of frequent loss of connectivity and unavailability of required bandwidth affects e-Governance services in the State. The issue is severe in the case of offices located in remote areas. This issue cannot be solved by a particular department alone. Launching of KFON Project in the state may resolve bandwidth issues and lack of connectivity to a great extent.

8. Limitations of State Data Centres

Commission noticed following limitations / inadequacies in the State Data Centres:

i. Lack of adequate computing power and storage space provided in the SDC hampers efficiency and performance of the applications and is a grave concern faced by almost all departments. The departments, even when they are willing to pay for the service are not able to get enough storage in SDC. This affects performance of the applications run by the departments during peak hours of

demand when a particular service rendered by the Department is sought by many.

ii. Capacity of SDC 1 and SDC2 are almost exhausted and the E & IT Department and Kerala State IT Mission are yet to take a considerate view in consolidating the data centres nor take any action to upgrade the infrastructure and to procure sufficient servers / SAN storage.

iii. Underutilisation of SDC Infrastructure – in certain cases, TSPs and System Integrators while suggesting specifications for hardware to departments over rate server specifications to compensate for software related inefficiencies. There are guidelines from MeitY for calculating server specifications. But many times, these are not calculated scientifically, or higher parameters are taken than what is actually required. Even though the rack space in SDCs is full actual utilisation of servers, especially in the co-located mode are low compared to their capacity. Similarly, there is difference between allocation of storage and actual utilisation by departments thereby limiting space required by other departments for hosting.

iv. The two Data Centres: Capacity of SDC 1 and SDC2 is almost exhausted and the E & IT Department and Kerala State IT Mission are yet to take action to upgrade the infrastructure and procure sufficient servers / SAN storage.

9. Human resource constraints

Smooth and efficient functioning of e-Governance applications need constant support from technically competent officials. Shortage of human resources with required technical competence in TSPs, departments and agencies like KSTIM has negative impact on adoption/implementation of e-Governance. It is reported by some of departments that the TSPs, especially NIC use human resources hired for and paid by one department for projects of other departments, leading to delay in providing

services to the department who originally entrusted work to the TSP. This creates a scenario where Departments do not get the required service on time even though they are paying for the service.

10. Recommendations

1. ARC recommends that government needs to merge Kerala State IT Mission and Information Kerala Mission into a single organisation. Organogram of the merged organisation shall be finalised based on proper scientific study of actual requirement and present IT environment. However, before any decision is taken in this regard government needs to study possible issues that may arise from the merger as there can be multiple resistance to change when the organisations are merged.

2. Performance of each official of the amalgamated organisation needs to be evaluated annually and continuance of each official needs to be based on appraisal of their performance, emphasizing on skill, knowledge updating, and delivery. Performance review needs to consider delivery, skills and knowledge updating. Government, after objective study of the new entity by a competent agency needs to consider yearly replacement of 20percent of the officials with new recruits. In any case, maximum tenure of officials shall not be extended beyond 5 years. It also needs to be considered that quality of human resources depends on suggested qualification and pay and service conditions offered. Government needs to consider paying qualified persons on par with IT industry standards.

3. An alternative suggestion is to evolve KSITM into a governing organisation for e - Governance eco system in the state. Decisions taken by KSITM needs to be implemented by all TSPs including IKM. KSITM and IKM (preferably C – DIT too) may be headed by the same person to ensure implementation of decisions taken by KSITM.

4. A web portal may be developed by the Electronics & IT Department for managing the entire process of approval from design to hosting of web / mobile applications of departments. A high-level committee (team) headed by Director, KSITM , as suggested in the transformation plan submitted by KSITM may be constituted to consider requests for development of web / mobile applications of departments. Persons with expertise in technology, government process reengineering, programme management and related domains along with persons with hands on implementation experience in e-Governance projects, needs to be included in the committee. The committee shall ensure architecture, compliance to standards and guidelines, interoperability, deduplication with existing applications in the state and common applications proposed or available in e-Gov App store of Govt. of India. The projects shall also be evaluated for Government Process Reengineering (GPR), incorporation of best practices, optimisation of infrastructure requirements and value for money. The committee needs to meet at least once in a month or more frequently as required, and pending requests for development of applications cleared in each month. If any department develop applications without approval of the above committee, neither domain name to be allocated nor hosting be permitted in the State Data Centre. Stringent action may also be taken against the Head of the Department/ office who developed the application without approval of the above committee.

5. IT Mission Director needs to be an administrator with technical knowledge or aptitude and capability to learn technology.

6. Audit by an Expert Committee may be done for analysing the extent of incorporation of GPR and best practices in current major projects and proper GPR needs to be included in next version of applications in a time

bound manner with preference to departments with higher people interaction.

7. At present, TSPs are selected by departments for design and development of their applications. But performance of all TSPs is not up to the mark. Hence, Government may revise TSP norms as the norms were fixed almost 20 years back based on the requirements of that period. Open tender may be encouraged for selecting vendors / TSPs to design and develop applications of departments. The current system of giving work order directly to TSPs may be revisited. Till revision of TSP norms government may initiate Limited Tender among TSPs. Department needs to sign Service Level Agreement (SLA) with the vendor / TSP selected for developing application. All terms and conditions including penalty clause shall be incorporated in the SLA. E & IT Department need to approve and publish model SLAs duly vetted by Law Department for the use of departments implementing e-Governance projects through TSPs, private System Integrators and vendors and communicate to all departments and agencies for adoption. Stringent action may be taken against the Heads of the Departments who entrust developing their applications to vendors/TSPs without following tender formalities and execution of SLAs.

8. Government may explore the possibility of using agile methodologies in software development projects of departments.

9. The nodal agency KSITM and SeMT needs to provide support for developing critical project documents such as DPR, EOI, RFP for departments. These agencies also need to provide technical / consultancy services for departments and agencies for the selection of vendors for implementation of e-Governance projects as per the guidelines prescribed by MeitY, GoI and the State Government.

10. NIC, a critical partner in the transformation journey of e-Governance, needs to undergo fundamental transformation in outlook, standards of solution development etc. Human Resources policy of NIC needs to be overhauled to attract quality development resources to the organisation. KSITM needs to have a role in this transformation.

11. The development of applications should start only after finalising specifications for system, software, user requirement etc. Government Process Reengineering shall be an integral part of the process and the To-Be and FRS document needs to be prepared with the assistance/support of KSITM / SeMT / government approved agencies and approved by the committee as detailed above. Once developed, the application shall be accepted by the department only after User Acceptance Test. Lack of communication and understanding between client departments and TSPs / developers needs to be resolved as it could affect development / maintenance and modification of the application.

12. Owner of source code and data of the application developed by a vendor / TSP for a client department shall be the State Government and the department concerned. The vendor / TSP needs to hand over the source code along with design documents and User Manual to Electronics & IT Department / KSITM for keeping it in safe repository. Electronics & IT Department / KSITM should make necessary arrangements in the State Data Centre to keep such source code and documentation. The Vendor / TSP also needs to hand over the source code of further updates and upgrades of the application to Electronics & IT Department / KSITM with proper version control. If a request from a department is received for using the same application, the Electronics & IT department needs to take necessary action to share/implement the application in that department also.

13. A functional ‘Inter Departmental Data Sharing Framework’ and an ‘Open Data Policy framework’ governed by IT Mission clearly laying out the rights of departments, organisations and people, and systems to implement the same needs to be implemented. Many countries like Estonia have such systems in place and government may need only to adopt the same.

14. A grid of Government TSPs governed by KSITM Digital Team needs to be formed and the code which can be reused should be made available for all. KSITM also needs to develop a portal in which departments shall publish SRS documents for time bound concurrence of IT Mission. Digital Team can review and suggest the reuse that is possible.

15. KSITM, in coordination with departments and implementation agencies needs to ensure proper software change management process and version control. KSITM shall develop and maintain Standard Operating Procedure (SOP) for the same.

16. Efficiency and competency of the vendors and TSPs needs to be evaluated annually by the above Committee (Team) and entrusting work with agencies in future needs to be decided based on their performance. A performance ranking system needs to be developed based on the projects successfully implemented, satisfaction level of departments and end users, adoption of standards, in house technical competency, adoption of industry best practices, user friendliness of applications developed, and so on.

17. Applications hosted in SDC needs to be reviewed periodically and unused and idle applications that consume large amount of space and power should be moved to archives to allow other applications in operation to use more resources, thereby enhancing their performance. Government shall audit

functioning of SDCs and its officials dealing with critical applications and data.

18. Departments needs to work along with the developers to simplify user interface and ensure user friendliness. User Experience Study and Design of UI according to it needs to be an integral part of SRS preparation. All TSPs should ensure this. This has to be monitored by KSITM. Many of the departments whose services are availed by a large proportion of the population have adopted e-Governance for providing most of their services. Based on field level studies ARC conclude that around 95 percent of the population depended on Akshaya centers to avail the services offered by these departments. e-Governance aims to provide government services to people without the need for them to visit offices. Existing system of e-Governance has not succeeded in achieving this objective. Instead of visiting government offices people now depend on the facilitator, which can be Akshaya Centres or agents like driving school to get required service. Hence, there is need for the departments to develop solutions to ensure that people can access services without approaching third parties. The method adopted by Delhi State Government may be followed for delivering services at door steps, till end-to-end solutions are in place.

19. Akshaya Centres facilitate more than 90 percent of e-Governance services available for the public. There is a tendency among the public to approach the Akshaya Centre even if they have access to computers and internet connection. Even though Akshaya Centres play a huge and commendable role in making e-Governance service available to all categories of people in the State, overdependence on these Centres hold back people from learning how to avail the services by themselves, which is a basic aim of e-Governance. Giving proper awareness to the public along with making the

UIs of the applications more user friendly, easy to comprehend and enhancing the user experience may help to solve this issue.

20. User Experience needs to be an important consideration in front end design for development of new applications. KSITM should develop uniform standards for front end designs and departments, with the help of E & ITD and redesign their user interface based on these standards. Priority needs to be given to departments and projects with higher people interface like e-District, LSGI, Registration, PDS, Agriculture etc.

21. Virtual meetings conducted during the COVID-19 pandemic period proved to be successful and effective. Hence, ARC recommends that government may continue with holding virtual meetings in the post pandemic period also and hold actual meetings only when it is imperative to do so.

22. Government needs to ensure that sufficient number of personnel with required skills and qualifications are available in all areas related to e-Governance. Electronics & IT Department should be entrusted with the responsibility to empanel and make available technically qualified human resources to departments based on their need/requirement.

23. IT Cells / Divisions needs to be constituted in all departments. In the case of departments who have already established IT Cell / Divisions, it needs to be strengthened with dynamic and technically qualified staff. Virtual IT Cadre needs to be constituted in every departments following guidelines to be issued by E & IT Department. Departments needs to have a plan for deploying and utilising services of officials who have successfully completed the Post Graduate Diploma in e-Governance and members of the Virtual IT Cadre. Department Nodal Officers needs to be trained in UI/UX which is easily doable.

24. Government needs to take necessary steps to enhance skills of officials working in IT Cell / Divisions, officials managing e-Governance projects, Every department needs to identify techno savvy, highly motivated IT skilled employees in their cadre and designate them as e-governance champions. They shall be trained and provided leadership position during the development of e-governance solution and its roll out. They shall be provided training on the latest tools, processes and technologies and opportunities provided to them for acquiring higher qualifications and certifications. Moreover, they should not be transferred for at least 5 years from that department to ensure that the software solution developed is stablised by that time.

25. Government needs to develop a plan/programme to provide training to all government employees for faster adoption of new technologies. This needs to be a priority of government and is unavoidable for the success of e-Governance.

26. All employees need to be encouraged to take up long and short term courses related to IT on the model adopted by Rajasthan Government as part of Capacity Building exercises for deployment of e-Governance in the state. As per the scheme of the Rajasthan Government fees for approved IT courses are reimbursed to employees along with an incentive of 25 percent in case the examination is cleared in first attempt. Government of Kerala may adopt this model for the State and may fully or partially reimburse course fee on successful completion of relevant/approved courses.

27. 'Kerala LMS' of IT Mission needs to be effectively used to run online courses and employees shall be encouraged to complete these courses. State Government institutions like IMG, IIITMK needs to take the initiative to conduct relevant courses of good quality using this LMS.

28. Correlation between success of e-Governance projects and commitment of political and policy level leadership in driving the projects are discussed and documented many times. Government needs to take suitable measures like sensitisation workshops, leadership training etc. for political and policy level executives for conceptualisation and successful implementation of e-Governance projects in the State.

29. Influential groups with vested interest could derail and/or delay e-Governance projects and hamper larger interests of the society. This needs to be identified and proper mechanism for prevention needs to be put in place.

30. Process re-engineering and resultant changes in the day-to-day business of departments are corollaries to implementation of e-Governance projects. While framing methodology for work study government needs to consider the above aspects. Present conventional methodology adopted by Personal & Administrative Reforms Department (P&ARD) for conducting work study needs to be reinvented and the possibility of adopting appropriate IT tools for making work study more scientific needs to be explored/evolved. An inhouse technical team may be constituted and necessary training may be imparted for the team to conduct the work study.

31. State Portal and SSDG under NeGP are envisaged by Govt. of India as single point access for people for informational and transactional services. Service of participating departments will be available to people in single sign-on. Though the project was conceptualised more than 10 years back ,its concept is still valid. The underlying technology stack for State Service Delivery Gateway, which provides seamless interoperability and exchange of data across multiple government departments at back end may need technology refresh.

32. Implementation of SSDG project in the state is not successful as envisaged. E&ITD needs to study the possibility of revamping SSDG project for achieving the intent of single point access for e-Governance services. Single point access will be a landmark in e-Governance as it eliminates the need for persons to remember multiple URLs, create profile in all applications and remember login details. Data entry, verification and authentication of persons can happen in one place/system and applications of all participating departments shall access core master data enabling the person who requires the service to fill only data specific to the selected service.

33. Considering popularity and wide spread use of mobile phones, all possible services need to be extended to m-Governance.

34. Unified Mobile Application for New-age Governance (UMANG), a Government of India all-in-one single unified secure multi-channel multi-platform multi-lingual multi-service freeware mobile app makes available services of Ministries and Departments of Government of India and more than 19 State Governments in a single mobile application. People can avail all the services through single registration and sign in. Consistent user experience, short learning curve, integration of many supporting platforms like Aadhaar, Digi Locker, payment gateway and backend integration with other government applications gives people a seamless experience. Adoption of latest technologies like Artificial Intelligence (AI) enabled voice access, Analytics etc., which will help people to interact with government in their own language, is also expected. For State government departments, it supports federal structure and cost associated is nil / minimal as the project is funded by MeitY, GoI. Departments can also link/offer their services without going through the proceedures for launching new applications including DPR, procurement process, on

demand scalable cloud infrastructure, built in GPR, sharing of best practices etc. Promotion of App based services is also undertaken through various media by GoI. Government needs to consider adopting UMANG Platform for the State.

Chapter 2

II. e-Governance Infrastructure

On-demand availability of IT infrastructure is one of the critical factors in success of e-Governance implementation. Major constraints and limitations noted while considering existing infrastructure deployed for implementation of e-Governance are:

i. The state has invested huge amount of money for development of IT infrastructure for the State. It is observed that capacity utilisation is quite low in most of the co-located servers in SDC. Often hardware sizing is not carried out scientifically by the departments and their solution providers, resulting in over sizing and wastage of resources. Considering factors like capital expenditure, usable life, technology refresh, power consumption etc., these are ideal to move into cloud platforms.

ii. Kerala State Wide Area Network (KSWAN) is the primary network used for e-Governance in the state. Last mile connectivity from Block headquarters (BHQ) to department offices is affected many times due to low bandwidth and lack of redundancy in KSWAN. Service quality, operational and maintenance issues in KSWAN affect delivery of e-Governance services from offices.

iii. Other issues concerning infrastructure are:

1. Every department has their own hardware and software requirements. At present each department quotes their requirements and makes purchases for themselves. Even though there is an approval system and standing government order to make most efficient use of existing infrastructure without resorting to new purchase, it is not often put into practice.

2. Two major types of operation, viz; co-hosting (where State Data Center provides both infrastructure and is in charge of management) and co-located hosting (where the infrastructure is purchased and owned by the department)

are prevalent at present. Most of the co-located servers are due for technology refresh.

iv. It is noted that large sums of public money are used for buying hardware with exceedingly high specification than what is actually required for applications of the departments concerned.

1. Recommendations

1. ARC recommends that government needs to put in place strict measures to prevent unnecessary purchase of hardware and software by individual departments. Existing cloud infrastructure at State Data Centre (SDC) shall be used optimally. 'Cloud First' should be the principle. All the applications need to be mandatorily moved to the cloud and hence all should be made cloud ready in a time bound manner and the migration completed in an year. There is need to encourage private cloud usage, empanelled by MeitY to reduce cost and increase efficiency of data centres.
2. Electronics & IT Department needs to initiate the process of migrating applications of departments running on co-located servers to cloud / virtualised platforms at SDC. Dedicated infrastructure may be allowed only if the application is critical and extra security needed. For this Departments shall take specific approval of E & IT Department with valid reasons substantiating why the application cannot be hosted in cloud platform. Without specific approval of E & ITD, co-located servers shall not be permitted in SDCs.

3. At present, there is no disaster recovery mechanism for majority of applications. Data replication of certain applications are carried out from SDC to NDC. Hence, establishment of 'Far and Near' recovery centre is needed for ensuring data security and service continuity in the advent of a disaster. Electronics & IT Department needs to prepare Business Continuity Plan and

Disaster Recovery infrastructure needs to be built for all critical applications at the earliest.

4. All offices and institutions of the government needs to be well connected for smooth and efficient functioning of e-Governance services. It is expected that the issue of connectivity will be resolved with the introduction of KFON. KSWAN services needs to be extended to those offices that require redundant connectivity.

5. SDC cloud/virtualised infrastructure needs to have capability to dynamically allocate resources (scale out on demand) based on usage. This will ensure performance and reduce wastage of resources. SDC needs to provide adequate resources at all times to ensure performance and availability of applications.

6. KSITM through SDC operator needs to ensure usage of all cloud management features of the system as envisaged, not limiting to virtualisation alone.

7. The state needs to explore the use of public clouds suggested by Government of India. Some of the applications can be hosted on public cloud platforms. A technical committee needs to be constituted to evaluate nature of the application and confidentiality of data handled for recommending use of public cloud platform.

8. Integrated Citizen Call Centers (CCC) will assist people to avail information on e-Services provided by the government. Audit of the functioning of Citizen Call Centres needs to be done to assess effectiveness/management of the entire life cycle of a service request / grievance including action taken by participating departments. Government needs to explore the possibility of delivering services of various departments through CCC when a person calls and request for the same. The call shall be converted to a request / application which is processed in appropriate / current systems and services delivered.

Chapter 3

III. Data Security and Privacy

e-Governance processes generate enormous amount of data, most of which are sensitive and critical. The level and scope of data generation as part of gathering information, and data mismanagement make *data security* and *privacy* an integral and vital part of e-Governance administration. There are examples from around the world where uncertainty over these issues led to conflicts between civil society and government. However, on the other hand better e-Governance needs more and more data regarding people and other entities necessitating security and privacy in e-Governance process.

Government of Kerala has automated reasonable portion of its process using various e-Governance application systems. File flow management software - *e-Office*, Payroll management software (*SPARK)*, Aadhaar enabled Public Distribution System (*AePDS)*, Integrated Financial Management System (IFMS) etc. are some examples. Wide use of e-Governance applications has resulted in gathering lot of personally identifiable information (PII) and has made the following tasks essential - ensuring confidentiality, integrity and controlled availability of data.

Confidentiality refers to the prevention of unauthorised accessing of data stored and transmitted. Compromising confidentiality is not affordable in e-Governance systems, as it shall lead to serious consequential issues. Integrity refers to the prevention of unauthorised modification of data stored and transmitted. Integrity if compromised in an e-Governance system leads to denial of services and other related issues. Most people centric e-Governance services offered by Government are based on data stored in the systems. Therefore, any issue regarding compromising of data quality can lead to denial of service.

The essence of democracy and the shift of power 'to the people' is a process wherein a person is elevated from being a 'subject' to being a 'person/citizen'. A person or

a citizen is the most integral and important entity in a democracy. The rights of a person need to remain inviolable, more so the fundamental rights. There are extreme cases where these rights could be deprived to a person, but that is based on fair trial and opportunity to present their case. e-Governance provides a platform where a person can avail optimal services from the government and become an important stakeholder in the governance of the country. Governments often, collects huge amount of personal data for providing online services. The data is also shared across multiple agencies for ensuring optimum delivery of government services. Government needs to put in place robust systems to ensure data security and privacy so that citizens do not suffer due to data breaches affecting their "Right of Privacy"

ARC while interacting with various stakeholders have identified the following concerns related to privacy and security.

1.Privacy violation

Data collected for e-Governance include sensitive information, like financial data, data on health, biometrics, religious or political beliefs and caste etc. Collecting some of this data/information is necessary for implementation of e-Governance projects. Any laxity in security systems and processes can lead to accessing the collected information/data by entities outside government and may lead to violation of the right to privacy.

2. Data as a controlling force

In an information society, where every information is increasingly digitised individuals have to provide a lot of data for accessing various services thus putting their trust on the reliability on robust systems for data protection and privacy. . However, the threat of using data collected for purposes of governance or generated otherwise, for undemocratic surveillance would always remain. Thus, data accumulation may even end up in the demolition of values of human dignity and privacy. The Central Government has introduced "The Personal Data Protection Bill (2019)" in the parliament which is

envisioned as a check on privacy violation through collection and use of personal data by the Government

3. Failure of the system

Once the entire system or a major portion of service delivery structure transforms into electronic platforms, there is an inherent threat of breakdown of the entire system due to failure of electronic platforms. Even though the system is not entirely dependent on e-Platforms at present, the state is targeting to migrate to an entire e-governance platform so as to make service delivery efficient and transparent. Therefore, the quality of implementing infrastructure for transformation needs to be ensured in the early stages. Proper back-up plans and Disaster Recovery sites needs to be in place to manage any unforeseen challenges arising from failures in the system.

a. Recommendations

1) Personal data captured for e-Governance applications shall not be used for purposes other than the intended ones without consent of the person concerned. Government needs to ensure that personal data is collected and processed only after obtaining consent of the individual, even when data is captured for a specific purpose/ delivery of service. Government needs to put in place suitable data governance mechanisms without delay.

2) In case data is to be used for research, scientific study or for analysis by the government, data on 'Personally Identifiable Information' (PII) needs to be masked by data management and de-identification proceedures like anonymisation, pseudonymisation etc., to ensure data protection.

3) Considering the enormity of potential threats, e-Governance systems need to be designed efficiently to ensure data security and minimise/eliminate threats to data security and privacy. Proper legal frameworks need to be formulated and

implemented. A set of recommendations for ensuring security and privacy are given below:

i. ***Ensure Data Confidentiality***

Personal data needs to be handled with utmost care as privacy is a fundamental right of the people. Sensitive personal data shall not be disclosed to anyone without informed consent of the person. Sensitive data shall never be handed over to third parties without anonymising 'Personally Identifiable Information' (PII).

The following measures are suggested to ensure confidentiality:

1. Use reliable security model which captures right set of roles and privileges to control access to data.
2. Implement required authentication and audit mechanisms which conform to the security model.
3. Identify critical data and encrypt them before transmission and storage, wherever possible. Data retention or the period in which personal and private information of a person is retained in a department shall be the minimum necessary period required to deliver the service. In cases where recurring service or interaction is required with the person, data shall be secured in the server in the State Data Centre in encrypted format. Authentication details like username, password etc., needs to be stored and transmitted only in encrypted form.
4. Leakage/sharing of authentication details: Domain users are provided controlled access to data through authentication mechanism (user ID and password). In Government systems, there are cases where authentication details are shared among government employees. This may cause serious issues like leakage of authentication details and violation of access privileges. The following measures may be taken in this regard:
    a. Each e-Governance software shall implement role-based access to data.

b. To prevent incidents of sharing authentication details government needs to issue guidelines and ensure its enforcement.

c. Government needs to issue guidelines and ensure its enforcement to ensure that the authentication (or role) given to an employee is deleted (or taken away) when the employee is transferred (or moved out of a given role).

d. Application Programming Interface (API) to access data needs to be made secure enough to ensure that only pre-decided part of the code gets access to data.

e. Software shall include feature to notify the department and SDC administrator when unauthorised access is attempted/made.

f. Government needs to issue guidelines and ensure its enforcement to ensure that roles assigned to users of software is verified by a competent authority at regular intervals. To enable this, software should provide option to the department administrator to generate reports showing roles assigned to different users. If data breach occurs from a government department, there needs to be provision for departmental inquiry and appropriate action shall be taken against employees and the affected person (s) shall be intimated. Reporting officers needs to ensure proper revocation of privileges in applications/systems before transfers, postings to other sections, retirement etc. in employee life cycle.

g. Ensure data protection at run time.

h. While it is important to emphasise ‘privacy of people’ and Data Security, it is also important to recognise the need for seamless sharing of data across departments in secured environment. Government needs to enforce data security standards and protocols to take up ‘One Government Approach’ in handling data provided to departments by people.

ii. Ensure Data Integrity

Government needs to take steps to prevent unauthorised users from getting privileges regarding modification access to data or to the application software. Policy or process to control data access, particularly for sensitive data like medical data needs to be implemented and properly monitored. Encryption is not enough to prevent unauthorised data modification.

The following measures are suggested to ensure data integrity:

1. Mechanisms like hash value checking needs to be incorporated to periodically check preservation of data integrity.
2. Data integrity issues can arise when personnel from private organisations and contract staff are to be given access to data stored in the server. Government needs to implement measures like background verification of persons having access to data, Non-Disclosure Agreement (NDA) between the government department, private organisation and its employees in case the data is handled by a private organisation during the implementation /operation of any project. Government may also use appropriate information security processes and tools to monitor activities of the organisations and its employees.
3. API to access data must be made secure to ensure that only pre-decided part of the code gets access to data.
4. Software shall have feature to notify the department administrator when unauthorised data access is attempted.

iii. Ensure Data Availability

Lack of timely access to required data can cause denial of service from e-Governance systems. Hence, it is essential to ensure availability of data to authorised users for intended purposes. Following recommendations are made to ensure data availability:

1. Prevent Data Loss:

   Data may be lost or corrupted due to malicious attack, server crash, unintentional deletion by software, catastrophic events like earthquake and fire, loss of encryption keys etc. To prevent data loss, the following practices may be adopted:

   a. Ensure required backup and recovery mechanism.
   b. Suitable Business Continuity Plan needs to be implemented for mission critical applications.
   c. API shall be made strong enough to allow only authenticated access to data.

2. Ensure required IT Infrastructure.

   Lack of sufficient IT infrastructure leads to denial of service. The following measures are recommended.

   a. Resources of the State Data centers shall be commensurate with increase in resource requirements.
   b. Client Department needs to bear expenses for enhancing resources as and when required by the client system. Government needs to ensure that departments are provided necessary budget provision to maintain IT infrastructure including cost for software updating, increasing hardware infrastructure etc. required by the e-Governance system. Procurement of servers shall be done by E & ITD and enhance cloud infrastructure. Only Virtual Machines need to be allocated to departments other than for exemptions detailed in the Infrastructure section.
   c. Large number of dormant software dumped at the Data Centre by different Departments needs to be removed to avoid wastage of resources.

4. General Recommendations

1) All new applications and software developed by any department needs to be scrutinised for application security. Each time an application software is added/modified, the software needs to be certified by a CERT-In

empanelled security auditing agency. SDC rules needs to be strengthened, if required to ensure that only security audited software is hosted. It is also advisable to security audit a running application within a required interval. The State Government need to have a regular mechanism in place for security auditing of critical ICT infrastructure Like SDC and WANs.

2) Presently different departments maintain separately the same data. This has the impact of multiplying data collection cost and more seriously shall lead to data consistency issues where changes in actual data is not made by all the departments. ARC recommends that it is advisable to keep single data repository under government control for all departments with necessary backup and recovery mechanism, provided systems are in place to ensure confidentiality, integrity and availability.

3) Government departments need to communicate with each other and be interoperable. This would reduce inconvenience caused to a person to produce 'certificates' and ‘attested certificates' of data from other departments to get services from a department and enable faster service delivery. This would also avoid redundant data being stored in different departments. But along with this, restricted and authorised access both within and between departments is equally or even more important. Officials who handle such data needs to be accountable and sign Non-Disclosure Agreement.

4) Laws and guidelines on data collection, storage, handling and backup need to be framed without any further delay.

5) Proper mechanisms need to be developed to audit third-party access to data, including by researchers.

6) Data privacy and protection policy needs to be introduced if Central Bill on data privacy do not become law soon.

7) Onus of data security including physical and network security as well as ensuring non-disclosure by its employers shall lie with the State.

Chapter 4

IV. Field Study on Selected e-Governance Applications

One of the significant objectives of e-Governance is enhancing efficiency and transparency in delivery of services to the people. Procedures for availing government services manually, from getting a certificate from local administration, to obtaining passes for transport of minerals or paying bills are lengthy and require physical presence of the applicant. By the introduction of e-Governance systems it is now possible for people to access/avail a broad spectrum of services provided by governments, remotely. This ranges from services of Local Self Governments (LSG) to the Central Government.

The systems should be designed to provide end-to-end service delivery, but a significant issue prevalent in most of the States in India to which Kerala is not an exception is the lack of digital literacy of its people.

Kerala has many advantages in implementation of e-Governance. It is one of the most e-literate states in the country where more than 4 lakh students come out of government schools after class 10 with knowledge on use of ICT. IT is part of the curriculum or an additional subject for most of the students enrolling for higher studies. It is evident that at least one person from almost every family, even in rural areas is digitally literate. With respect to connectivity, most of the telecom and internet service providers in the country operate in Kerala. As per the Indian Telecom Services Performance Indicators Report by TRAI published in January 2020, Kerala has 46.71 Million wired and wireless subscribers out of which 46.42 percent are in rural areas resulting in a tele-density of more than 128.25. At present majority of the population use internet and avail services through smart phones – a situation accelerated by COVID-19 protocols.

In spite of all these facilitating factors, adoption of e-Governance services, especially in self-service mode is much lower than expected.

To draw more profound insights into various aspects of e-Governance, and to chalk out the issues and constraints faced by the people and facilitators about e-Governance, ARC analysed two schemes - e-Certificate, and e-Health. Process evaluation of both programs was conducted through qualitative semi-structured interviews.

e-Certificate is chosen for analysis for its widespread use by people. It is used by most of the people for availing government services and is facilitated mostly by the CSCs.

e-Health is a project intended to enhance quality of health services provided. Changes in the nature of service delivery are to be handled by the Medical Officers, Health Centre and other medical staff, and when implemented in a comprehensive manner people will be beneficiaries of the system.

1. e-Certificate

Six Villages, two from three different districts of Kerala are selected for the survey. Each Village is chosen on the basis of distinct features to make the sample representative. Villages selected and reason for selecting the villages are:

1. Padavayal - Low literacy rate and higher proportion of ST population
2. Kuzhalmannam - Higher concentration of SC population
3. Valappad - Higher proportion of Fisherfolks and nearness to the sea coast
4. Panancherry - Nearness to urban centre and better infrastructure facilities
5. Thannithode - Semi-remote area with moderate infrastructure
6. Gavi - Remote location, lack of accessibility and lack of well-developed infrastructure.

Data collection included personal interviews and focus group discussions. Details of sample villages are given in Appendix A.1.

Majority of the respondents stated that they have derived benefits from e-Governance, and that they consider administration through e-Governance as efficient and faster than that of the conventional system. In the traditional system even simple procedures like issuing a certificate took more time and unexpected delays were often associated with it. With the introduction of e-Governance the procedures are simplified and delays minimised. It also provides option to get updates about status of any application/request submitted by them through SMS. People avail benefits of e-Governance from services delivered by various departments. Many of the respondents said that it was easier for them to approach a CSC than to visit office of a government department during office hours. Aided by the service of Akshaya centers, e-Governance has gained wide acceptability among the public.

a.Issues

Objective of this study is to understand whether benefits from implementation of e-Governance has reached the marginalised people, understand constraints faced by them in accessing e-Services etc. Some of the major issues common to all the regions are.

i. Infrastructure - lack of facilities for power backup, frequent failure of internet connectivity and outdated hardware, are common issues with the CSCs. In places like Gavi and Padavayal, where people have less access to conveyances to reach the Akshaya Centers, unexpected power failures have substantial negative impact. Other regions surveyed also reported similar issues where functioning of the CSC comes to standstill during prolonged power failures. A farmer of Kuzhalmannam village said that they faced difficulties in processing applications online when Kerala State Electricity Board was doing maintenance works. He also added that similar problems are encountered during mustering for social welfare pension, which led to dissatisfaction and caused inconvenience to a large number of senior citizens. Disruption in

Internet services is reported to be more frequent than power failures. At present, the CSCs depend on service providers to sort out connectivity issues. Implementation of Kerala Fiber Optics Network (KFON) across Kerala, which declares internet as a fundamental right may change the situation and provide faster and stable connections across the State. Disruption in connectivity is frequent and more prolonged in remote locations like Padavayal where the respondents reported connectivity failures that sometimes lasted for days. In places close to cities and developed areas loss of connectivity occurred at lesser frequency and downtime is also less. One student from Padavayal Village mentioned that the problem of loss of internet connectivity was remarkably high in the region and that the period of loss of connectivity was also more. She said it lasted even up to two days and the issue is more severe during monsoon. People of Gavi reported instances where they had to travel more than 60 kilometers to the Seethathode Akshaya Centre and are not able to complete intended procedures because of internet-related issues in the Akshaya Centre.

ii. Another observation from the survey is that attitude of employees in CSCs/Akshaya Centres also has an impact on service delivery. Where the employees are cordial and approachable people found it easy to get their work done/access services. In places where employees in the CSC are less friendly there is an increasing reluctance for people to visit the CSC. This stymies performance of service delivery through e-Governance in the area and creates discontent among the people. This an issue that needs to be attended and resolved through training and guidelines/instructions to employees in CSC/Akshaya Centres. This is a common issue and backwardness, or development of selected area has nothing to do with this. People of Gavi reported that they are happy visiting Seethathode Akshaya Centre as the employees are polite and give special consideration to people from the Gavi region since they travel 60 kms to reach the Centre.

iii. People of Padavayal, Gavi, and parts of Thannithode, have minimal means of transport to reach the nearest Akshaya Centres. People of these areas often have to forgo one day's work to visit the CSCs. People of Gavi suggested that setting up temporary facilities and operating them once in a month would be of great help to them, especially during periods like School / College admission, renewal of Life Certificate and Health Card, mustering etc., when majority of the residents have to cover long distances to reach the Akshaya Centres. A resident of Gavi said, "We have to travel at least sixty kilometers to reach the Seethathode Akshaya center. If the purpose of our visit is not completed before the last bus from Pathanamthitta passes Seethathode, we have no other option but to stay in the town or hire a taxi. Both these options are expensive for us considering our income. Also, the forest check post closes by evening and they will not let us in even if we have hired a taxi. All these make very regular things extremely hard for the residents of Gavi".

iv. There are some instances, like mustering and issuing of certificates for scholarships where large number of people have to get service from CSCs at the same time. Infrastructure available in most of the CSCs are not sufficient to handle the high demand though frequency of such occurrences is low. Many residents of Kuzhalmannam block complained that they had to wait for prolonged period to get mustering done for social welfare pension scheme. They had to spend on food and refreshments while waiting for their turn and said that infrastructure of the Akshaya Centres is inadequate to manage the huge crowds, even though the employees are ready to provide service.

v. Proactive functioning of politicians / social workers / local administrators have significant role in ensuring user friendly e-Services to the people. In the regions where the social workers and local administrators are more proactive, it is observed that behaviour/attitude of employees in the CSCs, unwanted delays, and limitations faced during processes like mustering etc., are addressed adeptly. A resident of Valappad region said that when the ward

members or other representatives give proper attention to issues regarding e-Governance or other services given to the people, the system is found to be more efficient. Majority of the respondents from Gavi, Kuzhalmannam, and Panancherry had the same opinion. In the case of places like Padavayal, where ST populations are on the higher side, proactiveness of the ST promoter plays an important role.

vi. It is found that the CSCs in some places make recurring mistakes in the application forms. Even though employees in the CSCs alone cannot be blamed for the errors, they need to be more cautious. There are large number of mistakes in the documents of persons in Gavi. Mistakes in the documents lead to denial of services including social welfare pensions and other benefits. Employees of CSCs in localities where the literacy rates of the people are comparatively less need to be cautious and help people to enter correct information. This issue was reported more in places with lesser literacy rates and development. A retired plantation worker in Gavi said that she was yet to receive pension and other retirement benefits only because ‘a’ in her name was replaced by ‘e’ in some of the documents. Many such cases were reported during the survey.

vii. Another serious concern, common to all the localities surveyed is dependence of majority of the people on agents to get things done. Even people with internet connectivity and other requirements depend on CSCs or agents for their needs. They are of opinion that filling up and filing of applications is a onetime need and it is not necessary to learn the entire process and found service of the agents to be convenient. In places closer to urban areas more people access the services themselves. But this is also a small proportion. Main reason for dependence on third parties is lack of technical knowhow and access to equipments like computers and internet in the backward regions. In developed areas people found it more convenient to pay for the services of an agent and entrust her to complete the procedure. Development of applications

with user-friendly and simpler User Interface may enhance the number of people accessing e-governance services directly, without dependence on a third party.

viii. The absence of human discretion in automated processes also has an impact on the life of people. At Thannithode, a couple who had problems in getting a marriage certificate quipped that if the process were manual, they could have made the officers understand their situation. But now, as the online application needs certain documents to be uploaded which they do not possess they are facing difficulties in obtaining the certificate. Contrary to this view, at some places people criticised officers for delaying the processes wherever they have discretionary authority and taking bribes to fasten the processes.

b. **Recommendations**

1. User Interface of the applications for delivering services are not user friendly and this affects efficiency in service delivery. ARC recommends to Government to take immediate and timebound action to upgrade / update user interfaces of all e-Governance applications delivering services to people. Priority shall be given to high volume services like e-District, services of LSGD, Motor Vehicles Department etc. KSITM can come up with common standards for User interface for efficient service delivery.

2. e-Proficiency of employees in the departments affects e-Service delivery adoption and efficiency. Providing required training to departmental officers on ICT and e-Governance needs to be a priority for the government.

3. Present employee strength of Akshaya project was envisaged for implementation of e-Literacy Programme across the State. The number of services delivered through the centres have increased manifold.

Government needs to take steps to redefine organisational structure of CSCs based on present requirements.

4. Most of the people consider Akshaya centre as an extended face of government for delivering services. On several occasions attitude and behaviour of the Akshaya entrepreneur and employees create negative image about delivery of government services. Government needs to provide training on behavioural aspects to Akshaya entrepreneurs and employees at regular intervals.

5. Government needs to put in place a mechanism to review functioning of the CSCs/Akshaya Centre and to collect feedback from people on availing of services through Akshaya. Suitable web / mobile applications shall be used for the purpose.

6. Government needs to consider allowing Post offices, Libraries, Residents Associations, Kudumbashree etc. as Common Service Centres for delivering e-services, as in the case of Akshaya.

7. Government has prescribed fees for various services through Akshaya centres. It is observed that some of the centres are charging more amount from people and also add services like scanning which may not be relevant for a particular service request/do not add any value to the service. Government needs to put in place effective mechanisms to monitor functioning of the centres and take stringent action, including cancellation of license of Akshaya centres who face consistent negative feedback like overcharging for services, rude behaviour etc.

8. Governments needs to direct District Administration, Akshaya District Offices and LSGIs to ensure availability of proper infrastructure and human resources at Akshaya centres during mustering, School / College

admissions etc., when large number of people are expected to avail services through Akshaya Centre.

9. Elected members of Local Bodies, SC / ST promoters and other field staff of various departments needs to play proactive role in ensuring quality of service given through Akshaya Centres. Government needs to entrust these officials to monitor services provided through Akshaya centres and report to the district administration for corrective action.

10. Government may actively think of expanding the presence of CSCs (Akshaya Centres) in more remote areas.

2. e-Health

e-Health Kerala project funded by MeitY; Govt of India was started in 2013. A detailed RFP was prepared and through tendering process a third party agency was identified as Software Solution Provider to develop and implement the software at selected hospitals in Trivandrum on pilot basis and to provide support for rollout of the software at all Govt hospitals in 7 districts, within a period of five years starting from 1st October 2014.

The Central Government considered the Kerala project as a pilot project intending to extend it later to other states.

e-Health project has two components - Hospital Management System and Public Health Preventative Care, both components are integrated at the core.

Public Health Management (PH) system handles preventive care. Each person is registered using Aadhaar number. Registration is done through camps conducted in schools, health centers, other such institutes and also by visiting the houses. Jurisdiction of each Primary Health Center is divided into sub-centers, and under public health preventative care these areas are surveyed by Junior Health Inspectors and Junior Public Health Nurses. Medical data of each individual is collected by

officials using Public Health Mobile application in e-Health tablet devices supplied across Kerala. They collect data regarding all diseases, and upload in the cloud server along with their remarks. These include control of communicable and non-communicable diseases, antenatal and postnatal care, immunisation, health packages, integration with national programmes like IDSP, NTEP, NLEP, NVBDCP, NPCDCS, NPCB etc. The officials also request individuals to visit the health center, if needed. GIS is used to mark location of residence and source of drinking water of the person. This data helps Medical Officers and Health Department to track prevalence and spread of any disease in any particular area. The system automatically generates an alert when the number of patients with contagious diseases goes beyond a prescribed value in any area.

Hospital Management System (HMS) manages functioning of hospitals from Primary Health Centers to Medical Colleges. Each patient is allotted a Unique Health Identification Number (UHID) based on Aadhar number of the person and is internally mapped and integrated to the PH System. Entire hospital workflow, including registration, token issuance, pre-assessment checks, queue management, OP consultation, laboratory, pharmacy, billing, stores, radiology investigation, inpatient management, casualty, HR Management are part of HMS. For each registered individual, there will be an Electronic Health Record (EHR), consisting of history, previous visits, investigations, medication, and also data collected from the field. Queue is managed by the system itself, which helps in ensuring waiting time for patients hassle-free. Most of the processes of the system is paper-free. Paper is used only to provide pharmacy prescription and laboratory reports. Case sheets can be printed and given if they need it for external use.

Infrastructure required at hospitals for implementation of e-Health is also provided through the project. It includes hardware, LAN, connectivity, UPS and UPS wiring. Hardware includes, mini PCs, ink-tank printer, token printer, sticker printer, barcode/ QR code readers, lean servers, PACS servers, token display systems etc.

Considering the criticality of e-Health system primary (KSWAN) and secondary connectivity is provided to minimise downtime at hospitals. Local 'Lean Servers' are envisaged at hospitals which will enable the hospitals to function offline during connectivity downtime. All e-Health points are provided with centralised UPS connectivity. As part of PH activities, about 9500 tablets are distributed to all the health workers across the state. e-Health system is deployed at the SDC cloud infrastructure of the state. Keltron is the TSP for e-Health and a Facility Management System (FMS) is used to manage the IT assets.

e-Health project is still in its rolling out stage. Primary Health Centers (PHC) and Family Health Centers (FHC) are gradually being transformed into e-Health platforms across the state. Works are at various stages in Medical College Hospitals (MCHS). e-Health has started functioning in Thiruvananthapuram, Kollam, Kottayam and Ernakulam MCHs. To capture facilitators' view of the system, semi-structured interviews were conducted with employees in different PHCs and FHCs, of Thiruvananthapuram district, and officials of e-Health Kerala Project Management Unit.

a. Issues

i. One of the major hurdles of e-Health system is the time consumed to capture all information/activities on the computer. Even though some doctors reported that the new system has eased their job, on an average time taken per patient has increased with the new system. In PHCs where there is no separate staff to do preliminary checks, it takes even more time for the medical officer. This issue is more acute in places that are densely populated. In some places like Chemmaruthy, health center switches of the system during rush hours and runs manually. At Poozhanad FHC, each medical doctor has an average out-patient load of less than 100 and the e-Health system is working smoothly there. In places like Chemmaruthy where the population catered by the health center is huge, out-patient load per doctor is around 200. Medical officer from

Chemmaruthy FHC opined that given the current efficiency level of e-Health system a doctor can manage it only if number of patients is below 100. Some doctors expressed the view that user interface of e-Health system still needs many modifications to reduce the time consumed per patient. They reported that the system has minor errors which has to be rectified, and also the system needs major updates which shall be done on an urgent basis. Another drawback of the current system used for e-Health is that it is not customised for use of different types of hospitals. From medical colleges to primary health centers the same software is used, and it has led to inefficiencies. Even though attempts have been made to customize the interfaces like OP registration, OP consultations etc., to suit different type of users, more customizations have to be done to make the system user friendly. e-Health PMU is now building up an in-house development team to take the project forward as the term of the primary system integrator has expired.

ii. Attitude of some of the Health Department employees towards the new system and their capability to adapt to new technology are not favourable for successful implementation of e-Health which affects efficiency of service delivery. In around 50 FHCs e-Health is running in paperless mode. It is noticed that if doctors prescribe online, pharmacies and labs become efficient. Pharmacist can dispense medicines quickly, otherwise the pharmacist will have to enter the medicines prescribed by the doctor offline, which is time-consuming. Lab equipment integration facility of e-Health can improve efficiency of the labs at hospitals. Wherever lab integration is done, lab tests become automated and the results get uploaded to the server automatically, avoiding manual data entry. With a fully computerized system like e-Health, the State Health Department can become more effective and efficient.

iii. e-Health Kerala Project Management Unit provides training in using the software, still some employees who are not used to computers find it difficult to operate the system. Lack of sufficient number of employees to complete the

phases of e-Health survey is another issue found during the study. Existing team in the public health centers have to carry out the investigations by themselves. This can make other phases of the e-Health survey longer than expected.

iv. e-Health data is critical in nature and hence data security is a concern. Health data of the entire population of the state is kept in e-Health cloud servers. Considering the sensitive nature of data, proper security measures are necessary to avoid any data breach. Earlier Aadhaar was considered as the unique ID but after the Hon. Supreme Court verdict, separate Unique Health ID [UHID] is created for the patient by authenticating the person with his Aadhaar Card during his first visit to the hospital as part of onetime Patient Registration process. During patient registration process, permanent UHID is issued to the person based on Aadhaar. For those who don't produce Aadhaar Card a temporary Health ID is issued, and treatment provided through e-Health itself with patient's details recorded against the temporary Health ID. The "One Patient, One EMR" concept can be achieved only if permanent UHIDs are allotted to all patients.

v. Considering data security issues, the hospital management system is accessible only in the KSWAN network provided at all hospitals. To maintain privacy of health data EMR of patients will be available at the hospital and is accessible to the doctors only when the patient visits the hospital. SSL is enabled for all e-Health-based domains. Measures are also taken to safeguard PH data. But comprehensive data security and data privacy policy, which is essential is yet to be in place for e-Health data.

vi. It is found that people are happy with the new e-Health system. They are ready to pay small amounts if provided with good service. Kuttichal PHC has introduced plastic e-Health card for 10 rupees. Patients have the option of getting a paper card free of cost or buying a plastic card. Everyone buys the plastic card. Even when the PHC ran out of plastic cards people insist on

plastic cards and are not willing to accept paper cards. E-Health allows people to take appointments for their next visit to the hospital. A token with time slot is given to the patients. It is very convenient for patients as they can avoid long waiting time at OP Clinics. e-Health also provides facility for doctors to issue advance review appointment token to patients at the time of consultation.

vii. Token display system using digital signage manages the patient queue perfectly at OP clinics. This has revolutionised crowd management at OP Clinics especially at Medical College Hospitals, as reported by doctors of major specialties.

viii. Previous treatment history of the patient can be viewed when Doctor selects a patient from the list of patients in the computer screen. This is a great advantage. EMR of the patients will be accessible by the doctors at all hospitals where e-Health is functional.

ix. Doctors can prescribe medicines and order Laboratory and Radiology investigations through the OP consultation screen. They can create their own templates for pharmacy prescriptions, which can be reused with or without making changes. This is a great advantage for doctors to reduce consultation time.

x. A centralised Picture Archival and Communications System (PACS) for radiology is implemented which stores X-RAY, CT and MRI images.

xi. SNOMED-CT an internationally accepted clinical terminology and recommended by Govt of India which enable clinicians to record data with enhanced accuracy and consistency is implemented in e-Health.

xii. e-Health system meets the entire workflow in a hospital starting from OP registration to IP discharge. The functionalities have to be firmed up for enhanced user acceptance and patient-friendliness. Even though essential reports are available, facility for generating reports according to requirements of the users need to be provided.

b.Recommendations

1. To achieve the aim of "One Patient One EMR" ,awareness needs to be created among the people regarding advantages of having Permanent UHID and necessary steps needs to be taken to promote Aadhaar based Permanent UHID.

2. Proper directions/guidelines need to be issued by government for better usage of e-Health and follow up by concerned department needs to be ensured. Training needs to be imparted to users on a continuous mode for better usage and acceptance of e-Health system. e-Learning system shall be put in place for imparting training to users. Customized Change Management program needs to be undertaken for e-Health projects for various stakeholders.

3. To harness the benefits of e-Health system it needs to be rolled out to all hospitals in the State as soon as possible.

4. Comprehensive Data Security and Data Privacy policy needs to be formulated and implemented in e-Health project. Information Security Audit and Certification (ISO 27001) needs to be done across the e-Health System at the earliest, as envisaged in the DPR.

5. PMU needs to be strengthened for speedy delivery of newer version, addressing critical customization requirements, bug fixes, new functionalities like telemedicine and adoption of latest technologies.

6. Since health data is getting built-up, e-Health PMU needs to undertake data analysis to provide inputs to government for better planning, by ensuring proper data privacy aspects.

7. Innovative technologies like IOT, AI, Block-chain, BIG data analytics needs to be explored for enhancing service delivery, research, predictive analytics compliance etc

8. In Kerala, people generally move from government hospitals to private hospitals and vice versa for treatment. Availability of single electronics health records across hospitals in government and private sectors will be beneficial both to people and consulting doctors. Government may explore the possibility of exchanging EHR across hospitals with proper data security, privacy measures and standards.

Chapter 5

V. Conclusion

e-Governance system is introduced to provide services to people and all stakeholders in an efficient, transparent, reliable, and cost-effective manner. This report is an attempt to study the journey of e-Governance in Kerala - from service provider, facilitator to service receiver. Intended as an evaluative report for reform recommendations the report mainly focuses on inadequacies/limitations of e-Governance system in the state. From interactions with the departments and the field surveys various issues are identified and recommendations for improvements are given in the respective chapters. Some of the concerns like need to use personal data for providing government services across departments, security risks due to data integration and use/misuse of discretionary authority needs to be addressed at a broader level. Report has taken a neutral stand in such issues explaining both potential threats and gains. Ways to minimise such issues are also discussed. Many of the other issues identified are easily manageable/ remedied through changes in technology and changes in administrative procedures. A major finding of the report is that no exclusion of any kind is found in providing e-Services in the state. Public value for e-Governance is quite high. Implementation of right reforms to address the above discussed challenges, will enable the state to achieve the goal of efficient, transparent, cost-effective, and reliable delivery of services to all the stakeholders.

More than 90 percent of certificates requested for by people are for submission to another department or office. Government needs to rethink on the need for certificates in this digital era where most of the services can be given based on verified and authentic data available within the government system. Service delivery and governance aspects need to be revisited. Focus on emerging technologies through institutions like Kerala Blockchain Academy, K-DISC and projects like K-FON will assist the state to get back into the innovative aspects of e-governance. There are also innovative IT applications being introduced by departments, like using drones by Forest Department for addressing

man - animal conflict, usage of Blockchain for building Aadhar Vault in e-Health Project etc. Other departments may explore suitable innovative approaches like these in their future projects.

The concept of Proactive or Real-Time service delivery and governance need to drive conceptualisation and design of next generation e-Governance systems. Government shall not delay strategic planning and implementation for e-Governance 4.0. In the meantime, suitable use of cases for adoption of Disruptive Technologies in Government needs to be implemented with adoption/adaption of National and International best practices and learning.

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Appendix A.1 Details of villages surveyed

Sl. No.	District	Block	Village	Reason
1	Palakkad	Mannarkkad	Padavayal	Low literacy and higher proportion of ST population
2	Palakkad	Coayalmannam	Kuzhalmannam	Higher concentration of SC population
3	Thrissur	Thalikulam	Valappad	Higher proportion of Fisher Men's community and nearness to the coastal lines
4	Thrissur	Ollukara	Panancherry	Nearness to urban center and better infrastructure facilities
5	Pathanamthitta	Konni	Thannithode	Semi-remote area with moderate infrastructure
6	Pathanamthitta	Ranni	Gavi	Remote location, lack of accessibility and lack of well-developed infrastructure

Gavi village in the district of Pathanamthitta was selected because of its remote location and lack of transport and other necessary infrastructure and facilities. Thannithode in Pathanamthitta is found backward with modest transport connectivity. Padawayal village in Palakkad district was selected because of its less accessible

location, along with a higher proportion of households belonging to the ST category and low literacy rate. Kuzhalmannam village from Palakkad district was chosen due to its higher percentage of SC population. Valappad in Thrissur was surveyed to get perception of people dwelling along the coastal belt. Panancherry in Thrissur district is a developed area, urbanised to a considerable extent with higher literacy rates and better infrastructure. This helps in contrasting the findings from the generally backward regions.