Artificial Intelligence-Enhanced Software and Systems Engineering 5

Christophe Gaie
Mayuri Mehta *Editors*

Recent Advances in Data and Algorithms for e-Government

Springer

Artificial Intelligence-Enhanced Software and Systems Engineering

Volume 5

The book series AI-SSE publishes new developments and advances on all aspects of Artificial Intelligence-enhanced Software and Systems Engineering—quickly and with a high quality. The series provides a concise coverage of the particular topics from both the vantage point of a newcomer and that of a highly specialized researcher in these scientific disciplines, which results in a significant cross-fertilization and research dissemination. To maximize dissemination of research results and knowledge in these disciplines, the series will publish edited books, monographs, handbooks, textbooks and conference proceedings. Of particular value to both the contributors and the readership are the short publication timeframe and the world-wide distribution, which enable both wide and rapid dissemination of research output.

Christophe Gaie · Mayuri Mehta
Editors

Recent Advances in Data and Algorithms for e-Government

Springer

Editors
Christophe Gaie
Centre Interministériel de Services Informatiques Relatifs aux Ressources Humaines (CISIRH)
Paris, France

Mayuri Mehta
Department of Computer Engineering
Sarvajanik College of Engineering and Technology
Sarvajanik University
Surat, Gujarat, India

ISSN 2731-6025 ISSN 2731-6033 (electronic)
Artificial Intelligence-Enhanced Software and Systems Engineering
ISBN 978-3-031-22407-2 ISBN 978-3-031-22408-9 (eBook)
https://doi.org/10.1007/978-3-031-22408-9

This Springer imprint is published by the registered company Springer Nature Switzerland AG
The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

Preface

Nowadays, data are the core of information systems and constitute a significant asset as they offer insight on the system's status and maturity. Data make a decisive contribution to valourizing private activity, as observed daily through the most powerful companies such as Google, Apple, Facebook, Amazon, and Microsoft (i.e. the GAFAM). They facilitate trade development, make flourishing advertising and entertainment, or enhance technology in favour of customers. Their power and strength are growing with a high velocity thanks to data valourization (especially information concerning customers).

However the interest towards data offers companies an immediate return on investment, obtaining benefits is more challenging for government organizations. Indeed, government services do not provide profitable services but rather fulfil the needs of the general interest, such as education, healthcare, safety, or security. Moreover, government administrations offer better protection of personal data rights, reducing their ability to exchange and combine data from different origins. The orientation towards collecting the explicit consent of citizens is a priceless guarantee of democracy as well as a complexity to provide customized services for better efficiency.

These first considerations legitimate the following interrogations: How to take advantage of data to provide better public services? May algorithms be helpful to valourize data and contribute to the general interest? Should government services be inspired by private services and/or expert government organizations?

An interesting concern to facilitate the development of better public web services relies on data reusability. It aims to define how to convert data extracted from an existing information system into data that is easy to manipulate and reuse in any context. Organizations tackle this subject through the prism of the data life cycle. Indeed, IT organizations evolve progressively from producing raw data, then organizing data to ensure a better organization and finally optimizing its usage between internal services and/or by final customers.

In the context of e-Government, the focus towards data reusability aims to fulfil different objectives. First, governments aim to enhance data quality to offer the highest preciseness of public services, which contributes to ensuring 'citizens' satisfaction, equality of treatment, and regularity of procedures. Then, the ability to reuse

data aims to reduce administrative burdens by introducing a single entry point instead of multiple shopping procedures. This may rely on the once-only-principle (OOP) or other back-office data exchange systems. Finally, data for multiple administrative proceedings reduces public service costs for better efficiency.

The current book tackles recent research concerning the rise of e-Government which largely combines two dimensions: the valourization of data that government administrations hold and the conception of algorithms to increase public services. The book contains multiple use cases to illustrate the modernization of government services. The editors are thankful to the authors who submitted their research work to this book as well as to all the anonymous reviewers for their insightful remarks and significant suggestions. We hope readers will find the book useful and be inspired to contribute to government modernization.

Paris, France — Christophe Gaie
Surat, India — Mayuri Mehta
October 2022

Contents

Abbreviations

3D	Three dimensional
ACT	American College Test
Agri	Agriculture
AI	Artificial intelligence
AMS	Assessment management system
API	Application programming interface
ARS	Agriculture Research Service
AUP	Acceptable use policy
B2C	Business to consumer
BESCOM	Bangalore Electricity Supply Company Limited
BMRCL	Bangalore Metro Rail Corporation Limited
BMTC	Bengaluru Metropolitan Transport Corporation
BWSSB	Bangalore Water Supply and Sewerage Board
BYOD	Bring your own device
C2C	Citizen-to-citizen
CCOPM	Capacity-capability-opportunity-potential Model
CCSS	Common core standards
CCT	Communication and collaboration tools
CE	Collaborative Enterprise
CGU	Brazilian Office of the Comptroller General
CIOs	Chief information officers
CITC	Communications and Information Technology Commission
CL	Culture of literacy
ConecteSUS	ConecteSUS system
CoSN	Consortium for School Network
COVID-19	Coronavirus Disease 2019
CRM	Customer relationship management
CSC	Common Service Centre
DAERA	Department of Agriculture, Environment, and Rural Affairs
DCL	District, Community or Locale
DETA	Distance Education and Technological Advancements

DHC	Descending Hierarchical Classification
DHS	Department of Homeland Security
DIA	Direct Internet Access
DIAS	Data and Information Access Services
DSFAS	Agriculture and Food Research Initiative's Data Science for Food and Agricultural Systems
EA	Enterprise architecture
EC	European Commission
EDSS	Electronic Document Delivery System
EGDI	The United Nations E-Government Development Index
e-Gov	Electronic Government
E-Governance	Electronic Governance
E-Government	Electronic Government
EIN	Education Information Network
EISSN	Electronic International Standard Serial Number
EMDS	Ecosystem Management Decision Support System
EMIS	Education management information systems
EPI	E-participation index
EPIS	Korea Agency of Education, Promotion and Information Service in Food, Agriculture, Forestry and Fisheries
ERS	Economic Research Service
e-service	Electronic service
EU	European Union
FAA	Federal Aviation Administration
FAC	Factor analysis of correspondence
FAO	Food and Agriculture Organization of the United Nations
FCA	Factorial correspondence analysis
FEA	Federal enterprise architecture
FFP	Filtering face piece particles
FSA	Farm Service Agency
G2B	Government to business
G2C	Government to consumer or government to citizen (according to the context)
G2E	Government to employee
G2G	Government-to-government
GBAD	Graph-based anomaly detection
GDP	Gross domestic product
GDS	Government Digital Service
GOI	Government of India
Green IT	Green Information Technology
GST	Goods and Services Tax
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
ICT	Information and Communication Technology
ICT-CFT	ICT Competency Framework for Teachers
ID	Identity document

IIA	Israel Innovation Authority
IITE	Institute of Information Technologies in Education
ILN	Indonesia literacy network
IMF	International Monetary Fund
IndEA	India Enterprise Architecture Framework
IoB	Internet of Behaviour
IoF	Internet of Farming
IoT	Internet of Things
IP	Internet protocol
IS	Information systems
ISSN	International Standard Serial Number
ISTE	International Society for Technology in Education
IT	Information Technology
ITSM	Information Technology Service Management
ITU	International Telecommunication Union
KPI	Knowledge performance indicator
LCAT	Land change analysis tool
LCMS	Landscape change monitoring system
LGPD	Brazilian General Data Protection Law (in Portuguese)
LMS	Learning management system
LP	Literacy posts
MAFRA	Ministry of Agriculture, Food and Rural Affairs
ML	Machine learning
MLA	Member of Legislative Assembly
MLP	Multilayer perceptron
MoE	Minstry of Education
MoEP	Ministry of Economy and Planning
MOOCs	Massive open online courses
MP	Member of Parliament
mRNA	Messenger ribonucleic acid
MS	Microsoft
NAII	National Artificial Intelligence Initiative
NAL	National Agricultural Library
NARO	National Agriculture and Food Research Organization
NCEPD	National Center for Educational Professional Development
NFC	Near-field communication
NGO	Non-Government Organization
NIFA	National Institute of Food and Agriculture
NLCD	National Land Cover Database
NLI	National Library of Indonesia
NLP	Natural language processing
NPM	New public management techniques
NSF	National Science Foundation
NTP	National Transformation Plan
OECD	Organization for Economic Co-operation and Development

OLC	Online Learning Consortium
PA	Perpusnas application
PAN	Permanent account number
PDS	Public Distribution System
PERPUSNAS	Perpustakaan Nasional
POER	Perceived organizational e-readiness theory
PVT	Process virtualization theory
QALY	Quality-adjusted life year
QM	Quality matters
R&D	Research and development
RI	Republic Indonesia
RPT	Related party transactions
RTO	Road Transport Office
SABER	Systems Approach for Better Education Results
SAT	Scholastic Assessment Test
SDG	Sustainable Development Goals
SEIR	Susceptible exposed infectious recovered
SEND	Smart Education Networks by Design
SFA	Singapore Food Agency
SHEILA	Supporting Higher Education to Integrate Learning Analytics
SICONFI	Public sector accounting and fiscal information system
SIS	Student information system
SLR	Systematic literature review
SOA	Service-oriented architecture
SSO	Single sign-on
SUS	Brazilian National Health System
SUV	Sport utility vehicle
SVIR	Susceptible vaccinated infected recovered
SVM	Support vector machine
T4edu	Tatweer Company for Education Services
TAM	Technology acceptance model
TETCO	Tatweer Educational Technologies Company
TOGAF	The Open Group Architecture Framework
TSM	Twitter social media
UAS	Unmanned aircraft systems
UAV	Unmanned aerial vehicle
UBS	Basic health units
UCE	Elementary context units
UK	United Kingdom
UN	United Nations
UNCRC	United Nations Convention on the Rights of the Child
UNESCO	United Nations Educational Scientific and Cultural Organization
UNICEF	United Nations International Children's Emergency Fund
USA	United States of America
USD	United States Dollar

USDA	United States Department of Agriculture
UTAUT	Unified theory of acceptance and use of technology
VAT	Value-added tax
VC	Venture capitals
VPS	Vaccination and protection strategy
WaPOR	Water productivity through open access of remotely sensed derived data
WCAG	Web Content Accessibility Guidelines
WHO	World Health Organization
XBRL	eXtensible Business Reporting Language

Chapter 1
Conceptual Model and Data Algorithm for Modernization of e-Governance Towards Sustainable e-Government Services

D. Vimala, S. Vasantha, and A. Shanmathi

Abstract The study aims to examine the effect of modernization of electronic government services on government service efficiency and citizen satisfaction to attain sustainable e-government services. The authors proposed conceptual research frame work to examine the determinants of Service Quality of e-governance and how the integration of State-of-the-art technology impact sustainable e government services. Case study approach is adopted to explore best modernization e-governance service delivery models practiced across the globe and development of data algorithm to validate citizen's data. The study is based on comprehensive in-depth literature review. The methodology followed in the study is a multi-faceted approach consists of development of conceptual research framework, case study method and data algorithm. This study scrutinized the relationship between the various attributes that help to attain sustainability of e-government services. The performance of the state's activities can be improved through excellent service quality which is determined by information quality and system quality. The modernisation of e-governance services in various countries proved that there is a positive impact on citizen satisfaction and sustainable e-governance.

Keywords Citizen · Data algorithm · e-Government services · Information quality · Modernization satisfaction · Sustainable e-government services · System quality

1.1 Introduction

The acquisition and utilization of electronic government services is a major challenge in developing countries. Digital gaps in society, a lack of e-government services

D. Vimala · S. Vasantha (✉)
School of Management Studies, Vels Institute of Science, Technology & Advanced Studies (VISTAS), Chennai, India
e-mail: vasantha.sms@velsuniv.ac.in

A. Shanmathi
HCL Technologies, Chennai, India

C. Gaie and M. Mehta (eds.), *Recent Advances in Data and Algorithms for e-Government*, Artificial Intelligence-Enhanced Software and Systems Engineering 5,
https://doi.org/10.1007/978-3-031-22408-9_1

and poor accessibility to technology are serious problems that require immediate attention. As a result, governments are innovating new techniques to make use of the resources efficiently to provide services to citizens. Citizens' hesitation to use an e-government system again after receiving subpar service determines the legality of investments in e-government arrangements and initiatives. The improved level of online services can stimulate e-government adoption by meeting citizen expectations [1].

Researchers and practitioners in this sector have been enthralled by the promise of e-government to increase pellucidity and reduce exploitation in the public administration. It has been stated that e-government in this context symbolizes a "new phase of government," one that is reshaping communication across all tiers of the government [2].

Asia is an example of a region that has been impacted by the electronic services provided by the government. Iqbal and Seo [3], for example, demonstrated that improving e-governance procedures was an effective approach. Electronic government services had a role in the restructuring of Japan's public sector, notably in terms of public accountability. Some experts say Singapore's superior e-government system has accomplished its objective. China's e-governance progress is also significant. The quality of public services suffers significantly when an economy's governance is weak. The ultimate aim of the World Development Report was also service delivery. The fundamental rationale for focusing on service delivery was that, in modern times, the public sector has been slow and insensitive to residents' needs. According to the World Bank and International Bank for Reconstruction and Development, public service delivery in emerging countries has not been consistent with population preferences (2005).

A true citizen-centric public sector can be enabled by a smart and proactive government. Globally it is proved that in many countries the government is trying to enhance citizen access to real-time answers, particularly for routine tasks through the application of artificial intelligence. But this could be improved when modernizing direct two-way interaction between citizens and the state through data and algorithm with the support of state-of-the-art technology to achieve citizen satisfaction.

1.1.1 Evolution of e-Government

With the development of the internet in the 1990s, there were widespread movements toward government IT adoption. Subsequently both technology and e-governance projects have advanced significantly. The number of internet and mobile connections is growing, and people are accessing in a variety of ways. They have begun to anticipate more and more services from corporations and governmental entities. The idea of e-government was first introduced in India in the year 1970s, for the management of data-intensive tasks such as managing elections, censuses, tax administration, and economic monitoring (Fig. 1.1).

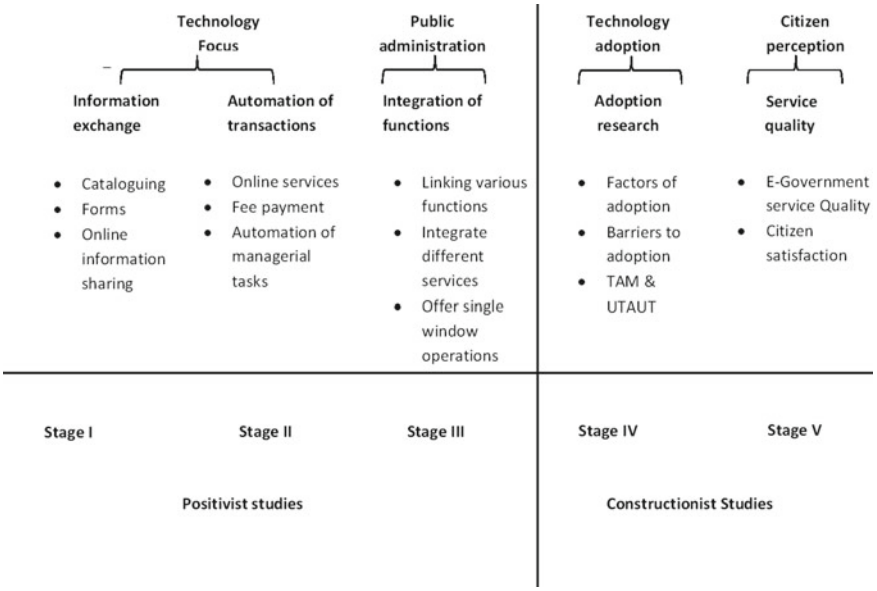

Fig. 1.1 Evolution of e-government

Positivist approach in this study adheres to the view that factual knowledge gained through observation is trust worthy. Positivist study highlights the initial stage of technology focus and public administration which comprises of information exchange, automation of transactions and integration of functions. Since 2020, i.e., post pandemic, the online activities of the citizen emerged to be quiet high. COVID-19 pandemic has increased the usage of e-government services and accelerated the digitalisation as well as trust towards e-government services.

The factors such as Information exchange and integration of all functions are experienced with the human intellects. Scientific verification of information is required in the positivist approach.

The next two stages of evolution are categorized under constructionist studies that consist of Technology adoption and citizen perception. Since the factors influencing adoption and barriers to adoption is identified through human construct. Subsequently e-government citizen quality and citizen satisfaction is measured by Government interaction with citizen for example G2C and vice versa, they come under constructionist studies.

At present, after the pandemic, the adoption of technology is irreplaceable. Digital technologies have made tremendous contributions in addressing social and economic problems faced by the citizens during pandemic as well as expedited two way interactions (Government- citizen) effectively.

Currently, the government states are in the transformational and developmental stage, i.e., the government reform strategy which radically change the way, people understand government and to promote citizen-centric service delivery mechanism.

It is a trend for recent years providing services through one-stop shop all over the world. It is a single point of contact where Governments can collect data through a single, integrated digital form for one or more services.

1.1.2 State-of-the-Art Technology in e-Government Services

Sayabek Ziyadin [4] conducted a study to prove that big data has made it possible to integrate e-government into government operations on a systemic level through data collaboration. Improvements in public services, enhanced institutional effectiveness, political involvement and transparency, as well as other advantages are anticipated from the deliberate, coordinated application of ICT to public administration and political decision-making. Rapid outcomes, on the other hand, can only be expected if a solid institutional framework as well as suitable technical and infrastructure are already in place. e-Government will mostly be deployed in industrialized and advanced developing countries shortly [5]. Poorer countries, on the other hand, are seeing new opportunities. In many cases, the biggest impediment to transformation is not due to financial or infrastructure issues, but political stumbling blocks. e-Government can help partner countries devise and implement political and administrative reforms, as well as improve market-oriented frameworks, through development cooperation. In addition to the obvious advantages of new technology, e-government should be used to advance good governance and strengthen reform-minded players in politics and civil society.

1.1.3 Modernization Effect on Service Delivery

Shouzhi Xia [6] in his study on e-governance and political modernisation, elucidated that pro-poor basic delivery has the potential to increase stakeholder engagement in local public policy discussions. In line with the preceding, this paper concludes that overcoming the barriers to e-governance adoption and implementation is critical to achieving better public service delivery. ICT is frequently utilized with the purpose to boost public administration's efficiency and stated regulation. Allocated efficiency is a measure of how well service or infrastructure packages match consumer expectations. This indicates that the overall allocation of components, in precise, not only the allocation of factors by the public institution alone must be considered [7]. Even if higher public-sector service delivery costs high, allocated efficiency may be viewed as significantly higher if ICT-based solutions enable the issuance of a personal identity (Newman et al. 2008). In this setting, e-government is associated with New Public Management (NPM) techniques, which rank the effects of administrative activity to determine excellence.

Sullivan [8] has discussed Modernisation, democratisation and community governance.citizens receive timely and corrupt-free public services is therefore crucial. A

Strategic and Tactical Systems Level Framework and Model of Effective Public Service Delivery are created through this research with the comparison of utilizing benchmark framework to experience hassle-free service from e-government. The benchmarking framework was built based on research evidence from literature reviews, worldwide experiences, and case study analysis.

Arendsen et al. [9] investigated ways governments can improve service delivery by switching from reactive to proactive and proactive to predictive service delivery. The study aims to developing a transition model for e-government from one-stop shops to no-stop shops in order to overcome the challenges and complaints by Converging zero-form service delivery They suggested to make it successful, the government requires competent software trained personnel in software development, operations, information security and cryptography to manage the complexity.

1.1.4 Modernisation and Sustainability of e-Government Services

Nair and Prasad [10] said that modernizing government enhances an efficient public service delivery, addressing the development constraints, and fostering wellbeing is all possible with good governance. This might aid in achieving the Sustainability goals of development in the year 2030, the use of ICT to assist service initiatives continues to be a major factor in bringing about this shift, particularly in light of pressures from the global market and increased competition on a global scale. It provides amazing potential to innovate, enhance, and improve working methods while also providing several benefits. The greatest surge in digitization, however, will only be truly futuristic until it will assist each and every one in every corner of the globe. In order to achieve sustainability at all levels, it is essential to establish the strategies by recognizing the procedures, processes, and outcomes [11].

1.1.5 Challenges of Modernising e-Government

Several issues are hindering the development and construction of e-government.

(1) **Issues with institutional mechanisms**: It does not have a consistent top design. The premise of the e-government system is weak. The terms and regulations must be enacted.
(2) **Organizational and management issues**: It lacks a cohesive system. Task overlap, self-regulation, and bullish kind of management are still prevalent.
(3) **The issue of Wastage of Resources**: There is a disparity between localities. It is still typical to see on-going construction, low infrastructure usage rates, and significant information resource waste.

(4) **Data integration issue**: Public resource development is scattered, and data aggregation is challenging. Data towers, information enclaves, and digital voids still remain serious issues.
(5) **Performance evaluation issues**: Performance evaluation is inadequate in the e-government system. Poor performance results from a focus on construction rather than application.

1.2 Objectives of the Study

- To develop a Conceptual model to identify the antecedents of modernization of e-government services for sustainable development in e-government services.
- To design algorithm to validate and register citizen data to access the e-government services.
- To analyze the modernization effect of e-government performance with the integration of state of the art technology towards sustainable e-government services, across the globe, through a case study approach.

1.3 Review of Literature

1.3.1 Information Quality

Information systems are described as the standard of information generated by a certain system by DeLone and McLean [12]. The system's output is what is referred to as the system's output when defining the quality of the information provided. Information quality is a multifaceted concept that encompasses a wide range of attributes and characteristics. Experts use a variety of assessment indicators to determine the quality and value of information; as a result, different aspects of information influence the value of information. According to Wang and Strong [13], four variables determine the quality of information: (1) Intrinsic, (2) Accessibility, (3) Contextual, and (4) Representational.

The context of information quality on e-government websites is taken into account the characteristics of information quality. Experts and other organizations routinely offer definitions of e-government; nevertheless, only the World Bank [14] is considered in this study, which states: Government agencies employ information technology to transform connections with individuals, corporations, and other government agencies, is referred as e-government.

1.3.2 System Quality

E-Governance system quality refers to the performance and usability of the system among rural citizens. The operation quality of an e-government system is referred to as system quality, and it is a level that encompasses a variety of factors such as credibility, flexibility and response time [15]. The acceptance and success are influenced by the aspirations and interests of various stakeholders (Osman et al. 2014). Few studies have examined how users view these services, and the majority of these models are intended to support policymakers and practitioners in assessing the e-government services (Wang et al. 2005).

Because online service no longer requires face-to-face interaction and because the information system has replaced the window for online government services, the quality of e-government systems has become the users' first impression (Rai et al. 2002). System quality is therefore one of the most crucial metrics for assessing overall system performance and user perception.

1.3.3 Service Quality

The quality of e-governance services delivered to citizens is measured by service quality. Service Quality is defined by Zeithaml and Bitner [16], as Customer perception of the service provided based on responsiveness, reliability, empathy, assurance, and tangibility. This report focused on interactive and "one-stop" services while researching service quality. A mature electronic government service ought to be participatory in both directions. Personal taxes, license updates, fines, birth, marriage, and death announcements, among other things; enterprise registration, tax applications, customs, foreign exchange reports, and patent filing. e-government services integrate internal government systems with external internet interfaces to enable user interaction. In addition, an e-government system entails offering more extensive services for individuals, enabling them to conduct business more effectively [17]. Bhuiyan [18] conducted a research to see how the government prioritizes e-government services through profound service quality. The government of Bangladesh is working hard to attain this aim with the aid of quality services.

1.3.4 State-of-the-Art Technology

With the Case study approach, based on various model, it is suggested that it is a process consisting of 4 stages: strategizing, anchoring, enacting, and reinforcing. The stages identified and the constituent initiatives of each stage are all conceptual innovations, and in demonstrating the cyclical nature of the process the present study has revealed the path-dependent nature of Technology as well.

The failure to incorporate innovative and modern technology into e-governments is a major stumbling block to the deployment of e-government services. Frameworks and models must be updated regularly to keep up with technological advancements. It is critical to use cutting-edge technology for technological projects to last and remain competitive (e.g., e-governments). Governments should use more advanced and cutting-edge technology to promote e-government services because traditional technologies are becoming more complex and expensive to operate and maintain in developing countries. It is emphasized that cloud computing platforms should be used for e-government services [19].

Roland Traunmuller [20], a study on e-government was done, to modernize public administration and realign public governance. The e-government application landscape examined is divided into three categories: (1) promoting a knowledge-based economy, (2) providing residents and business customers with information and services, and (3) enhancing governmental cooperation.

1.3.5 Citizen Satisfaction

Van Ryzin [21] has defined Citizen Satisfaction as the combined decree of the citizens towards the quality performance of the local government. Gilmore and Souza [22] have stated that enhancing the responsiveness towards the mechanism of the public delivery system results in Citizen Satisfaction. To assess the performance of the services provided by the government, the level of service supplied to citizens must be assessed. Citizens are increasingly using the internet to interact with different government services, raising the standard for efficient service delivery. There is a greater emphasis on enhancing citizen happiness and loyalty to government e-services, which result increasing of the public participation. Even though, Kuwait has over 3,000,000 internet users, the percentage of citizens who are satisfied with e-services is not high. This shows Government needs to focus more on citizen satisfaction than concentrating infrastructure.

Sayed et al. [23] conducted a study to determine the maturity of the organization. The findings of the study shows that Kuwait intends to improve citizen services to promote citizen happiness. This would be impossible to achieve without first assessing present services and developing KPIs. The major goal is to implement an e-government solution in Kuwait, particularly in the educational sector, in order to make decision-making simpler and more efficient. This research lays forth a strategy for implementing KPIs for e-government services. The proposed technique constructs and measures key performance indicators based on mission, vision, and objectives (KPIs). The author has employed five major measures: loyalty, involvement, productivity, communication, and satisfaction.

This has a big impact since, despite having good ICT infrastructure; the proposed road map emphasizes the need to strengthen e-government services such as increased

teacher and student training, the construction of new schools, the design of long-term educational policies and plans for Kuwaiti residents to deal with significant advancements in the ICT industry with all feasible improvements.

1.3.6 Efficiency of e-Government Services

The efficiency of e-government services determine citizen satisfaction. One of the major compelling arguments for modernizing e-government reform is that it improves government institutions' internal or production efficiency, to save the money of people who are paying taxes. There are two methods to get done with this theory. One instance is the automation of application management and process simplification to increase productivity for reducing employment. Another goal is to lower public procurement costs by boosting price transparency, constantly promoting competitiveness in the global market, and instituting more accessible and market-friendly acquiring procedures. These savings, however, may be counterpoised by costs that limit or eliminate such adeptness expansions, as discussed further below. The integration of the advancement of technology in the present system improves efficiency. e-Government is viewed as a tool for,

1. Increasing the efficacy of civic government,
2. Improvement in the public service delivery, and
3. Strengthening the ingenuousness and clearness of political processes.

Shouzhi Xia (2017) conducted a study to investigate the factors that can help to enable e-governance. Government transparency, offline e-government services engagement, and the level of naivety are the three components of political modernization. After evaluating secondary data from numerous databases, the researchers concluded the following things. To begin with, greater political modernization in Asia will start of expansion of e-governance. The availability of open data, in particular, improves government openness. Offline political participation and liberty rise as a result of e-participation. Second, because open of data and electronic participation influence various areas of political modernization, deciding which characteristic affects the process of e-governance and makes the modernization challenging. The findings suggest that the government must highlight the role of e-governance in order to enhance political modernization.

1.3.7 Sustainable e-Government Services

World commission on environment 1987 explains that the terms, Sustainability and sustainable development are often used interchangeably to denote developing pathways that meet present needs to adhere to the capacity of to fulfill the requirements of upcoming generations. The ability of a government to implement e-government services effectively while addressing the needs of many stakeholders is referred to as sustainability. Sustainability focuses on two main characteristics of e-government service implementation and citizen adoption. Citizens-centric, trustworthy e-government services that leverage cutting-edge technology to provide an efficient, effective, cost-effective service, as well as full participation and satisfaction from all users, define sustainable electronic government services.

A study on the effects of electronic government on several aspects of growth concerning sustainability in the Middle East and North African countries area was published in 2021 by Iyad Dhaoui. This research represents data from more than fifteen countries. The preliminary part of this study includes the role of electronic government services in good governance. The next section describes the effect of good governance on long term development and the impact of development of electronic services provided by the government. The results demonstrate that the majority of good governance practices promote sustainable or long-term development. Research reveals that digitalization improves regulatory quality to a lesser extent and boosts government effectiveness and corruption control when it comes to the impact of development on governance parameters. Rather than being a catalyst for progress, e-government-related variables affect several areas of sustainable development, contrary to expectations. The study makes some recommendations based on these findings. Fundamentally, regulations governing the use of digital technology must be properly integrated into public sector reform. Middle Eastern and North African (MENA) nations should enhance their institutions for education and skill development, boost accountability, and improve business conditions.

1.4 Proposed Conceptual Model

The researchers have proposed a model to integrate the State-of-art-of technology in the name of modernization to attain sustainability in e-government services (Fig. 1.2).

The Conceptual Model is developed based on the systematic literature review that is based on DeLone and McLean's Information System Success Model developed in the year 2003 by Joshi and Islam [19]. The proposed conceptual model explains how information quality and system quality contribute to the service quality of electronic government services.

The proposed model validates Service delivery and improves the efficiency of e-government services and citizen satisfaction and involvement in participating in the e-government services. The proposed conceptual model is framed to attain sustainable