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RESEARCH PAPER

# The adoption of the Internet of Things in E-government towards the Smart Government

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**A B S T R A C T:**

The Internet of things (IoT) has given exceptional changes to all contexts in our lives, as the data can be collected and informed by smart devices in a real-time. E-government appears to be one of the many IoT application settings that can greatly benefit from the use of IoT, reforming and enhancing public services. The adoption of IoT in e-government encompasses a number of risks and challenges, including technological and non-technological issues that have to be resolved in order to create effective services and applications. This paper aims to propose a framework for smart government (SG) based on IoT usage. Also, it offers an inclusive overview of the key challenges and opportunities accompanying these new communications technologies in various disciplines. The findings indicate that IoT has a wide range of potential advantages, which suggests that IoT facilitates efficient knowledge management, sharing, and collaboration across domains at all levels of the organization.

**KEY WORDS**: Smart government, IOT, e-government, smart Service.
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## 1. INTRODUCTION:

The IoT can be defined as the physical objects that are connected to the Internet and are capable of communicating with and identifying themselves with other devices (Kopetz H., 2011). The idea behind the IoT is that by supplying sufficient amounts of high-quality data that can be used to develop the knowledge needed to make the best decisions at the right time, these devices and the connection between them can help e-government. E-governance is a relationship between citizens and their governments that is mediated by technology in terms of communication, policy formation, and expressions of the public will. The emergence of the Internet of Things is one of the most rapid and fascinating advances in information and communications technology (ICT).

Despite the fact that networking technologies have proliferated over the past 20 years, until recently they were mostly used to link up conventional end-user devices like mainframes, desktop and laptop computers, and, more recently, smartphones and tablets. According to Gartner Inc., the IoT market is currently focused on implementing smart cities and SG, with an expected 3.3 billion connected items being deployed in just smart cities in 2018 (Jain R., 2016). In addition, in 2025 IoT devices will be connected to the internet 152,200 times per minute, and in 2030 it's predicted that there will be more than 25.4 billion active IoT devices, (Jovanovic B., 2022).

The Internet of Things (IoT) is significant because a physical (or sensor) object that can communicate digitally can relate to more than just one entity; it can also connect to nearby objects and data infrastructures. The use of ambient intelligence enables a situation in which numerous physical things cooperate (Ramos et. al. 2008). The item is incorporated into a complicated system where the total is more than the sum of its parts (Brous, P., & Janssen, M., 2016) For instance, it is feasible to

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identify the location and duration of traffic jams and to track trends, fluctuations, and relationships in the road network over time by employing networked sensors and cameras to assess traffic flow.

The next generation of e-government is expected to be a smart government (Seang-Tae Kim 2013). Despite being in its infancy, smart-government programs have been implemented with encouraging outcomes in Dubai, Australia, Singapore, and Moldova (Li et. al. 2015). To offer sustainability and meet the requirements of the public, these governments use cutting-edge operations, communications, and technical infrastructures across many fields (Harsh, A. & Ichalkaranje, N., 2015). Governments all over the globe have begun spending billions of dollars on the transition from e-government to SG as a result of discovering the many benefits (Al-Enezi, et. al. 2018). In this paper, we propose a state-of-the-art framework for (SG) that demonstrates the various parties involved, their relationships, the process used, and the specifics related to the challenges faced when implementing SGs. The rest of the paper is organized as follows; the second section illustrates the literature review of the IoT in relation to smart government. In the third section, the research method will be introduced. The fourth section describes and defines the concept of Smart Government (SG). The proposed framework based on IoT for the SG will be explained in section five. In section six the challenges that impact the adoption of IoT in smart government will be presented. In the conclusion, the paper's limitations and suggested areas for future research will be highlighted.

## 2.Literature review

Government operations and services today must be responsive, user-centered, easily accessible, and compatible with advanced smart technology and consumers' fast-paced modern lifestyles. Customers can download and upload forms, pay taxes and fees, and view information using modern government applications (Shareef, et. al. 2012). To ensure that smart-government services are widely adopted, governments must provide high-quality services via smart applications. The applications are made to offer customers a high level of service and convenience while also adapting to their changing needs (Almaiah, & Nasereddin, 2020). Smart government applications benefit both consumers and governments, according to evidence. Citizens will be more convenient when they use a smart device (phone) to access services anywhere and at any time. In comparison to traditional systems, governments can reach a much wider audience, especially those in rural areas and those who lack computer literacy (Al-Maiah, et. al. 2020).

Huoneo and Zhang introduced the idea of (SG) for the first time at the International Conference of "Web Smartness and Smart Operating Technology" in 2007 (Petrov, 2011). Cow and Lew in Australia first introduced it with a technical approach in e-government for providing services to the smart city. Some countries are transforming e-government projects into (SG) projects in response to the academic development of the (SG) as a new generation of e-government (Petrov, 2011). One of these projects is the National Electoral Governance Plan for India from 2012 and the National Smart Government Goals for the UAE from 2015 (Zynoddini et. al. 2028). In this regard, the Smart Mongolian Government Project was introduced by the World Bank in January 2014. In June 2014, the Croatian government announced its "Smart Croatian Government" initiative, which emphasizes accessibility, efficiency, and openness. In this project, a variety of services are made available to citizens electronically, including birth, marriage, residency, and vehicle papers. The project began with 14 services and finished the second year with 27 services.

The idea of a "smart city" is one that is increasingly popular, with applications ranging from eco-cities (Chumakova, O., 2017; Eremia et. al. 2017) to various ICT features in a city. Various frameworks, models, and techniques have been illustrated in the literature. In 2000, Kliksberg conceptualized the strategic role of the government in society and developed its managerial and structural capabilities using the concept of "smart government" with a sociological and social approach (Kliksberg, 2000). Sudan also discussed the IT infrastructure-based smarts of Andhra Pradesh's local government in India in 2000 (Sudan, 2000). After almost two decades, this article has the best definition and approach to the contemporary mental model of (SG). In addition, Gil-Garcia et al. (2014); Mellouli et al. (2014); Jiménez et al. (2014); and Scholl and

Scholl (2014) have proposed a model of smart government.

Von, (2016) designed a model demonstrating an integration approach to smart government in public administration. The central idea of this model is that, in order to advance the development of future public administration, cyber-physical systems (CPS) will incorporate intelligent networking objects like sensors, actuators, and M2M communication. CPSs are heterogeneously networked systems that connect and integrate actual physical objects with electronic information and communication infrastructure. These are IT systems that are incorporated into things like machines, buildings, or processes that use sensors to directly detect physical data and actuators to control physical processes, but they also analyse and store the data that is collected. They can also actively or passively engage with both the real world and the digital one. They are linked together for this purpose by digital communication devices (M2M) and by international networks. This provides the opportunity to utilize the data and services that are accessible globally (Von, (2016)

Furthermore, (Arief, & Sensuse, 2018) proposed a conceptual model of smart government in Indonesia. In order to enhance the outcomes of the conclusions drawn from the model initiation, the model validation employs statistical techniques and academic experts' professional judgment. The Nusantara Smart Government Model's (NSGM) initiation model has 20 basic components or critical factors, according to the results of the Delphi 2nd round validity (NSGM). Using a methodology to conduct a review of the literature on assessment and derive an assessment theory from that literature's findings over the previous ten years (2009-2018). According to this model, findings identified the first step toward (SG) as intelligent planning. Validation with expert judgment results, 80% agreement and validity index >0.7 with this work demonstrates that NSGM is prepared to move forward with the validation of the actual government data indicators in Indonesia. A study (Herdiyanti et. al. 2019) was carried out to pinpoint the goals of smart governance, map the relevant governance indicators currently in use, and create a performance model for smart governance. The model was then put into practice in Surabaya City as a case study after being approved by three experts in smart cities and e-government evaluation. The proposed model yields 29 indicators across three different domains and seven assessment-related aspects. The model proposed to be used as a guide for smart governance performance evaluation to support smart city initiatives in Indonesia.

According to the best practices and standards applied, the authors (Al-Obaithani et. al. 2018) suggested a maturity model rank smart government. All academic literature, reports from both the public and private sectors, and other literature pertaining to six-Sigma, best practices, and international standards were all thoroughly reviewed by the authors using descriptive analysis. In order to suggest best practices for the SMART-government maturity model, this paper's conclusions have been drawn regarding the importance of conducting extensive research. Furthermore, the study's findings (Althunibat et. al. 2021), there are different requirements for each of the three stages (the static, interaction, and transaction stages) in terms of system compatibility, resource availability, information quality security, perceived functional benefit, awareness, perceived image, self-efficacy, perceived uncertainty, and perceived trust. The proposed model findings show that there are significant differences between user expectations and perceptions regarding the adoption and use of smart-government services at each stage. By examining consumer perceptions and needs in terms of adoption across the three stages, according to the author's perception, this model adds something special to the body of prior research.

## 3.Methodology

The information for this study was gathered through written sources and references, including books, publications, magazines, university scholars, and thesis-documented research. Along with the literature reviews that have been posted on national and international websites through educational research, scientific research, literary research, and media, to achieve the search level in an appropriate theoretical framework IoT-based (SG) with the research problem-determining the quality of information that has been collected. In order to accomplish the research's goals, the use of meta-synthesis technique to thoroughly examine scientific literature pertinent to the topic at hand and articulate the dimensions of smart government. In addition, the descriptive approach is utilized to gather accurate and thorough data on

the issue, which is followed by a discussion of the research topic's theoretical underpinning. This has aided in proposing a suitable framework to provide outcomes that were supposed to advance the reality that was the subject of the investigation.

## 4.Smart Government (SG)

The Internet of Things (IoT) is a universal network of interconnected items that may interact with the real world and provide services using current internet standards in addition to gathering information from the environment (sensing) (Kim et al., 2017). However, the term "smart government" refers to a new wave of ideas for using information technologies (ITs) in the public sector that gather, connect, and analyse massive amounts of data produced and processed in (near) real-time. Early on, the term was applied quite widely to characterize a government that comes up with innovative and engaging answers to difficult issues (Kliksberg, 2000). Although the term "smart" has gained popularity, there is no universal agreement on what it means, even though it is frequently used as a synonym for virtually anything seen as contemporary and intelligent. Today, the phrase "smart government" refers to a broad range of digital public sector efforts that creatively combine physical, digital, public, and private contexts in order to develop a citizen and customer-centric approach as well as citizen and customer involvement (Schedler et. al. 2019).

According to a study (Gil-Garcia et. al. 2016), (SG) is the next evolution of electronic government that uses innovation and public participation. The government creates new public values through its services, legislation, regulations, participation, and other means, which are further considered to be the source of innovation. Therefore, (Anthopoulos, L. G., 2017; Arendsen, et. al. 2011) proposed that the transition from e-government to SMART government is controlled by laws, politics, values, and evidence. In addition, (Petrov, 2014) defined the (SG) as a next-generation form of ICT-enabled public-sector transformation into a smart era which stands for:

*Social:* Delivery of services that are highly individualized and geared toward the needs of the individual also enables the public, particularly via the use of social media and crowdsourcing tools, to collaborate with the government.

*Mobile:* Utilizing smart mobiles and their networks along with cloud computing on the back end to distribute information and services, get contributions from citizens wherever and whenever they like, and use Apps, SMS, Social Media, and Web-on-the-go.

*Analytics:* Using big data analytics, sensors, and context-aware services to personalize messages and transactions and drive policy action.

*Radical-Openness:* Accountability and Transparency are transformed by "Open by Default" and "Open by Design," which involve citizens in co-creation and allow businesses to use data for creating new services.

*Trust:* Effective cyber security to ensure service flexibility, availability, and privacy protection.

The objective of a smart government is to transition from a hierarchical bureaucracy to a more adaptable network structure by improving methods, procedures, and tools for managing government organizations internally as well as their interactions with the public and other social activists. This allows for the participation of various government agencies to emerge within the network structure. Additionally, we believe that smart cities are not "ignored" by the smart government. Instead, a smart government drives the development of smart cities while using them as a testing ground for its policies such as; collaboration and service co-production testing, etc. In this regard, it is necessary to recognize the supplementary forces that relate these terms to one another.

## 5.The Proposed Framework of IoT-based Smart Government

Smart government is usually referred to as an e-government technical union and smart cities. This form is referred to as new Generation- (next generation - smart government), which combines smart cities and government 2 (Seang-Tae Kim 2013). Many countries aim to have a government similar to this one. It is an open and transparent involving the public in all of its affairs. The goal is to create a comprehensive framework to assist public and private stakeholders in making knowledgeable decisions about investment strategies for (SG). The aim of traditional e-government is to automate the existing administrative procedures. It is a top-down procedure that is unclear and closed, favouring administrators over the general public. Overall,

this was a problem with few observable advantages for the normal citizen. However, the goal of (SG) is to offer citizens and their governments a courteous, open, and affluent living. Since the process is bottom-up and led by the people, citizens stand to gain more from it than government officials.

There are various frameworks and models proposed for IoT (Li et. al. 2015), smart cities (Fernandez et. al. 2015; Anthopoulos G. L., 2015), IoE (Mitchell et. al. 2013), and smart government (Ameen, et. al. 2018; Herdiyanti et al. 2019; Anthopoulos et. al. 2021). The need for acceptable smart-government frameworks is growing as a result of the amount of research on smart cities that lead to the implementation of (SGs). This paper proposes a maturity framework for IoT-based (SG) based on prior efforts, as demonstrated in Figure 1.

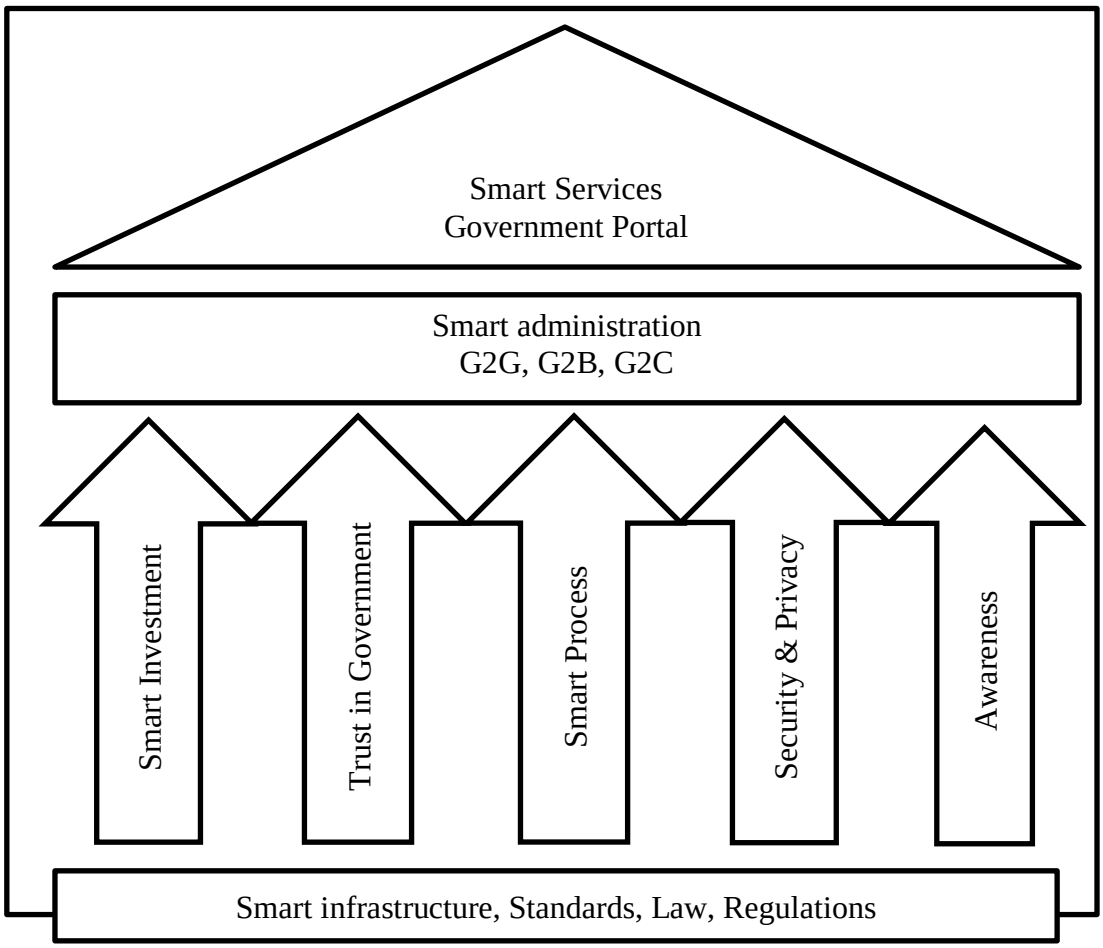


Figure 1: Smart Government based on IoT Framework

5.1Smart infrastructure:

The architecture of a smart government framework is depicted in Fig. 1; the realization of a unified system through the integration of disparate information systems is part of the (SG) architecture. This can be accomplished by either adding new features to current systems or by switching to government cloud computing in place of the current infrastructure. The proposed framework is structured as progressing from the bottom to top, which represents readiness, to the middle level, which involves collaborations and integrations between four main components (government, citizen, innovative technology, and business), all of which are connected to the presence of support systems in the top level to move towards a smart service goal that has been jointly established at the top level. The bottom level is the closest level to the end user and a foundational or readiness stage, during which the fundamental elements are ready, including ICT infrastructure (Sensor networks, Mobile

Computing, cloud computing, and fog computing), eID, Open/Big Data, Social Media, and Analytics (Li et. al. 2015). In addition, includes the policy, Standards, Institutional Laws, Rules & Regulations, budgeting, and capital. These networks will be upgraded to 5G technology. This essential component of smart government is the IoT's core and unfortunately, it is most vulnerable to security threats. Any government must have extensive telecommunications infrastructure. The newest sensors, ample storage to handle Big Data, power supply, and many other things are among them.

5.2Smart Investment:

This level is the closest level to the lower level, in which several components are integrated and collaborated together, such as smart Investment, Trust in Government, Smart Process, Security , Privacy, and Awareness. Smart investment is an extension of basic investing ideas and comprises selecting investments that will best serve your unique needs and enable you to reach your long-term financial objectives. The market for the (SG) will expand as a result of the increased investment in these technologies. In order to provide their citizens with trustworthy, efficient, and secure services, government institutions around the world are boosting their spending on network management, cybersecurity, and other (SG) initiatives. Despite the uncertainty of the global economy, more and more countries in recent years have shifted toward e-government. Existing technological resources must be updated to make way for modern IoT systems in order to go from e-government to (SG). In addition, includes e-Procurement, Human Resources, Office suite tools, Social Media, and Analytics, along with ICT ability and skills such as; IT skills and capacity building (Petrov, 2014).

5.3 Trust in government:

There are different definitions of trust in government, according to (Santa et al. 2019; Carter and Belanger, 2005; McKnight et al., 2002; Lee and Turban, 2001) trust in government can be defined as the public's evaluation of government based on their perceptions of departments' and agencies' integrity and capability to provide services in accordance with the expectations of the citizens. Carter & Belanger (2005) emphasize the need for citizens to have faith in the government. Additionally, according to Rehman et al. (2012), one of the key reasons why e-government programs fail is a lack of trust in the government. Citizens should actually believe that government agencies provide m-government services for their benefit rather than for the purpose of monitoring and policing them (Althunibat et. al, 2021). The suggested framework suggests that this construct is related to the user's purpose to use (SG). The public's expectations regarding the government's potential goals in providing IoT service orchestration are tied to their faith in digital services. IoT acceptance and successful integration in a digital society require public trust in developing technologies, as it is very difficult for society to adopt the technology without trust (Guangwei, et. al. 2022).

5.4 Smart Process:

The concept behind the smart process is a platform that aids the organization in taking control of the processes, enabling it to accomplish more with innovation technology and fewer resources and faster turnaround times. In other words, the smart processes serve as a superb unit in identifying, modelling, analysing, automating, and monitoring service procedures. The administrative process used by the government that is based on smart networks is known as a smart process. Whether the objective (SG) is an expansion of the current e-government or settles with it being a new generation of e-government is one of the crucial decisions taken before system-process implementation.

5.5 Security and Privacy:

Security and privacy issues are among the major obstacles to smart-government initiatives. Although the previously stated advancements in government have significantly improved citizens as a whole, almost all smart applications are susceptible to hacking through modern attacks like inside curious attacks, outside forgery attacks, likability attacks, background knowledge attacks, collusion attacks, Sybil attacks, eavesdropping attacks, spam attacks, and identity attacks (Kitchin R. 2016). For example, in the context of healthcare and smart homes, device makers and service providers might have access to private information, Also, the extensive trajectory data gathered by smart mobility applications can be used to deduce a user's position and mobility

habits (Riccardo et. al. 2015). The security of IoT devices as well as the data transferred between government institutions and the cloud must be guaranteed. Data can readily be tampered with during the transmission process in a smart application because it involves the interchange of data across numerous devices and agencies. Although some techniques, including firewalls and protocols, can control data traffic in IoT communications, they cannot ensure the integrity at endpoints due to the majority of IoT devices' limited computational capability. Furthermore, Smart-government providers must successfully handle the problems caused by the perceived danger. Concerns around identity theft and data theft (such as ransomware or malware) are visible and growing, which makes people hesitate before using some unfamiliar services. The privacy and security of data or devices are the key concerns while using (SG). Users of smartphones typically have extremely safe, private, and controlled data usage. This component has also been discovered to be relevant by earlier researchers such as (Althunibat et al., 2021; Hans et al., 2005; Wu & Wang, 2005) in their work. According to the vulnerabilities of the devices, networks, and transaction processes used in a (SG). A smart government can only be considered secure if it can monitor its operational circumstances and quickly identify any unusual events.

5.6 Awareness:

How well-informed are the people about technology and the existence of electronic services in their countries (Al-adawi et al., 2005; Mofleh & Wanous, 2008). Users must first be aware that the electronic government offers its services through internet-capable devices (Abdelgaffar & Magdy, 2012). In fact, a big worry is how aware the public is of (SG) services and their availability. Additionally, it has been noted in several types of research that a lack of awareness adversely impacts people's adoption (Rehman et al. 2012; Ovais et al. 2013; Anas et al. 2014). In reality, the lack of awareness causes interest in any digital government services to decline. This claim was supported by earlier research e.g. (Ovais et al. 2013; Dahi & Ezziane, 2015; Omer & Al-Nasrallah, 2014). The degree to which a user's knowledge and awareness may enable them to learn the characteristics of smart-government systems, and use their functions well, in addition to identifying the pros and downsides, has a substantial bearing on the acceptance of these services.

5.7 Smart administration

The use of technological innovations to improve public administration is referred to as smart administration (Giełda, M., 2019). The third level permits cooperation and integration of G2G (Government to Government), G2B (Government to Business), and G2C (Government to Citizen) duties. To achieve certain goals from the (SG), such as an improved quality of public services (QoS), Accountability, transparency or open government, participative or stakeholder engagement, etc., all (SG) components must be managed and supported by the system and applications. By producing detailed reports, governments can measure things like administrative performance and grievance redressal by choosing the right measures. Agencies are given the authority to examine patterns of public spending on various economic sectors, track pertinent sustainable development goals, examine trends in cultivated areas, and use public services like water, power, waste management, and transportation, as well as public safety measures. Additionally, administrators can examine and correct issues directly from a comprehensive dashboard with a single window.

5.8 Smart Services:

The goal of smart government is to deliver services through platforms/portals like smartphones and the Internet to maximize efficiency. The establishment and implementation of standards, policies, and long-term development plans for digital and electronic transactions, which allow customers to complete their transactions reliably and on time, are other issues that the smart services sector is addressing. One of the core aspects of public safety at all buildings and businesses is the management of smart system projects designed to monitor electronically protected buildings. This result demonstrates that if the services increase the efficiency and effectiveness of the transactions, citizens will be more willing to accept smart services. Utilizing advanced technology, and (SG) services (Almuraqab, 2017).

## 6.Challenges

The integration of IoT in e-government can be very encouraging as well as challenging at the

same time. In this section, the focus will be on the challenges of the use of IoT in e-government and consider both technical and non-technical challenges.

6.1 Technical Challenges:

The internet of things is a network of interconnected computers, mechanical and digital machinery, items, animals, or people that are given unique identifiers and the capacity to send data across a network without the need for human-to-human or human-to-computer interaction (Chatterjee et al. 2018). These interactions include data exchange and peer-to-peer communication, as well as communication with back-end systems that are typically found in the Cloud. Because IoT devices are autonomous, we can benefit from automating various functions, integrating data, and services, and analysing the behaviour of autonomous entities and the data gathered.

It should be noted that the type of hardware and software that IoT devices use are what define them as distinct entities. The provision of services that can be supported by the entire set of available nodes depends critically on the heterogeneity of the devices. By doing so, there will be a chance to develop universal services for "injecting" E-government features into the devices (Papadopoulou et. al. 2019). The variety of IoT devices makes it challenging for them to connect to one another and communicate. The lack of agreed-upon standards for data exchange, which can refer to communication between devices and information systems, between information systems and end users, such as citizens or organizational entities, as well as between various government agencies and organizations, adds to the difficulties.

The incorporation of Artificial Intelligence (AI) in e-government applications presents another difficulty for the adoption of IoT in that sector. With the help of AI, intelligent apps can be created using the gathered data. The available e-government applications will be able to support humanlike activities with the adoption of AI. Software components may be given the ability by machine learning to recognize patterns, make decisions on their own, or learn from models that have been adopted and modify decisions in response to the state of the environment. The advantage is that systems can learn the right line of action while operating rather than having to be fully "programmed" in advance. Results are anticipated to be significantly improved by the ability to integrate learning capabilities into IoT devices themselves as well as to combine device-centric insights with gathering intelligence in the Cloud (Cooke, 2018).

Another obstacle to the IoT's adoption in e-government is security. A specific user's data must be protected from unauthorized access because many devices may be able to access the e-government services offered by the Cloud. When we concentrate on sensitive personal information, this aspect of the issue is more severe. Although cloud architectures already include security mechanisms for gaining access to their services, the autonomous nature of IoT nodes presents new difficulties.

Furthermore, the risks associated with hacking tools and systems to obtain information and data have been extensively discussed (Cho et. al. 2021). Potential cyberattacks on the devices themselves, which can take over control of them and make them operate dangerously and insecurely, pose another threat. Adopting multi-layered security services may be a solution for the security of the applications due to the IoT e-government services' complex architectural design. E-government IoT systems can use firewalls, authentication, encryption, security protocols, and intrusion detection systems to provide the required level of security. Moreover, the other issues with IoT devices, according to Balte et al. (2015), include device heterogeneity, ubiquitous data exchange, and scalability, through wireless technologies, energy-optimized solutions, localization and tracking capabilities, among others. It can be noticed that regardless of who uses them, who owns them, or which industry they are used in, data privacy and security continue to pose the greatest risks associated with IoT devices.

For the safe implementation of smart governments, privacy issues and current IoT challenges must be overcome. In general, both corporate and individual IoT device users should be technically minded and regularly check the devices for vulnerabilities. Additionally, it is crucial that Internet Service Providers establish IoT-related regulations.

6.2 Non-Technical Challenges:

The IoT based e-government faces not only technical challenges, but it also faces non-

technical challenges such as financial, organizational, political, and legal issues. Such issues can have an impact on the tactical, strategic, and operational decisions that must be made and the actions that will follow them with regard to the use of IoT technology for e-government. Decisions may be made regarding the expansion of current e-government services and systems or the creation of new ones that make use of IoT. Such choices about tactics and strategies for advancing IoT-based smart government initiatives need not originate at the highest levels of government but may instead be made at the local authority level. In any case, IoT-based information systems and services should be developed to be in line with the strategy and goals of the federal, state, or local governments.

The move to IoT (SG) necessitates the availability and existence of the necessary resources, such as 5G telecommunication networks, which in turn necessitates strategic investments for their implementation. The viability and sustainability of IoT (SG) services depend on financial support, including funding and billing models. Information systems and services based on the IoT must be officially approved in order to adhere to laws and regulations. Strong institutional support is necessary for the effective adoption of IoT in (SG). Governments can be driven to adopt IoT while also enforcing technological evolution through institutions and the law itself. The investment is a further non-technical barrier to IoT adoption in e-government (Chatfield & Reddick 2019). Despite the fluctuation of the global economy, more and more governments have shifted toward e-government in recent years. To move from e-government to (SG), it is necessary to update existing technological resources to make way for new IoT systems. These include upgrading all current networks to 5G networks, utilizing the newest sensors, having ample storage to handle Big Data, having power supplies, and many other things.

One of the fundamental issues affecting the IoT adoption in e-government in general and having an impact per se is trust (Gilbert et al., 2004). Citizens will be partners in the e-government efforts in order to increase stakeholder trust in the government. Additionally, trust acts as mediating factor when dealing with online entities. As a result, the desire to foster trust among e-government stakeholders is regarded as a fundamental principle in designing and developing successful (SG) systems. In order to increase the level of trust in government, a legal framework that controls privacy, access to data, data use, and liability is necessary for (SG) initiatives (Conradie & Choenni, 2014; Janssen et. al. 2012). Politicians and citizens alike are very concerned about data sensitivity.

## 7.Conclusion

The use of IoT in e-government has tremendous potential because it opens up a wide range of services and applications that might be accessible to and helpful to the general public. IoT-based systems can be used to create brand-new, cutting-edge e-government services or to improve and expand upon the ones that already exist. When used in crucial security and safety contexts, such systems and services may become even more crucial for ensuring public safety and disaster risk reduction. The proposed smart government framework highlights the technical and non-technical challenges affecting the initiative of (SG) based on IoT. The findings revealed that governments ought to prioritize providing educational sessions as a means of encouraging citizens to adopt smart-government applications. Additionally, social media apps should be used more effectively to advertise the advantages of (SG) services. Last but not least, it was discovered that technological self-efficacy substantially influenced the adoption of smart governance. This study furthered the findings of other studies highlighting the significance of IT skills for users and government workers. In order to remove the obstacles to using e-government services, an effort should be made to train those who lack the necessary IT skills. In addition, the relevant technical skills are required to create and deploy emerging technologies in grass-roots government decision-making in order to achieve the intended effect. The grass-roots government should reinvent the talent training mode and make talent training more contemporary and scientific in order to train or introduce talent. Governments must embrace IoT technology progress to reap its benefits in developing a public value paradigm since, despite numerous obstacles, the major benefit of IoT diffusion in public services remains normative and the adoption of such services is continuing to emerge.

Furthermore, in order to recruit high-level talent to engage in the governance of the grass-roots government, we need to change the incentive

mechanism, develop a favourable compensation structure, and improve the working environment. Through precise requirement detection, the spending of financial resources on various IT systems, advanced analysis, and intelligent user responses, the proposed smart government created the foundation for future service transfer. This accomplishes the fundamental goal of (SG), which is to provide smart public services, effective and transparent public administration, and substantial social benefits for all stakeholders in society.

## Conflict of interest

I certify that I have no connections to or participation in any organization or entity that might have a financial interest (such as an honorarium, educational grants, speaking engagements, membership, employment, consultancies, stock ownership or other equity interest, expert testimony, or patent-licensing arrangements) or non-financial interest (such as connections, affiliations, knowledge, or beliefs) in the topic or materials discussed in this manuscript.

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