



Review of Literature Related to the Study of e-Governance

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Abstract: Governments across the world consider Digital Government to be a political priority Tambouris et al. (2014), and in recent years significant capital has been invested in the development and adoption of Digital Government services by public bodies Meneklis et al. (2005). Despite all the good intentions, efforts, and considerable investments in Digital Government projects, a majority of these projects (60–85%) fail Heeks (2005), and the existing investment and development efforts are often ineffective and a massive waste of funds. Furthermore, the Digital Government environment has developed rapidly, yet Digital Government systems are less dependable and up-to-date, as compared to e-business and e-commerce Sedek et al. (2012). In the context of the Digital Government, some particular requirements or concerns must be taken into account, not only during the implementation phase but also at the early design or architecture modeling phases Meneklis and Douligieris (2007).

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Introduction:

Literature sheds light on the failure's cause, which is ineffective project management, unrealistic planning Anthopoulos et al. (2016), lack of adequate ICT infrastructure Joshi et al. (2017), and a significant difference between project design and the reality that comes into play while implementing the design Heeks (2003). The Digital Government's success level is heavily influenced by widely-held views regarding maturity models Joshi and Islam (2018), technical standards and formal design practices Meneklis et al. (2005) to design sustainable Digital Government services. To-date, multiple case studies demonstrate that architectures aid the successful implementation of Digital Government initiatives and strategies Martin et al. (2004). Numerous architectures have been developed, but there are documented challenges regarding these architectures to assist governments in establishing operable and effective Digital Government infrastructure. Consequently, it can lead to reductions in Digital Government project failures Tambouris et al. (2014).

Hornnes et al. (2010) claim that architecture in the public ICT area should be regarded as an essential component of a state information infrastructure. Additionally, it should be adjusted to different principles and meet a broader spectrum of

needs rather than solely conventional types of infrastructures, including specific executive, administrative, and organizational context that it targets. Yet, in the context of Digital Government, the problems are mostly associated with implementation, not strategies Rabaiah and Vandijct (2011). Thus, many studies have illustrated that architecture design is one of the significant strategic steps towards the successful implementation of Digital Government. The design of a Digital Government architecture favors reflection of multiple aspects, including legal, organizational, semantic, and technical views EU European Commission (2019).

In this presented work, we particularly want to highlight the technical view, including the high-level technical building-blocks that constitute the Digital Government architectures, specifically the software components and the used architectural style and standards. Architecture should be viewed both as a risk-mitigating tool and as an organizational shaping method to minimize project failure and handle risk in organization networks Janssen and Klievink (2012).

The crucial characteristic of the architecture is that it can be regarded as a common communication channel between various stakeholders of an information system Meneklis and Douligieris (2007). Conclusively, in the context of Digital Government,

an architecture gives an overall overview of Digital Government components, i.e., building-blocks and connections between components Sedek et al. (2011). More investigation is required concerning the design of Digital Government architecture to reach the adaptability and accountability requirements of Digital Government infrastructure (Janssen 2007; Hornnes et al. 2010). There are numerous researchs available in the corpus of literature pertaining to Digital Government that deal with the Digital Government infrastructure and implementation. Based on the collected literature, this research attempts to analyze particular literature dealing with Digital Government architectures systematically. Results from international studies have illustrated that design-reality gaps Heeks (2003), ineffective project management, and unrealistic planning, are the most common reasons for the Digital Government project failure (Anthopoulos et al. 2016; KPMG 2017).

Considering the high failure rate of Digital Government projects, rapid technology advancement, and newly defined requirements by the governments, we reason that it is appropriate at this stage to provide common ground for the comparison and evaluation of available Digital Government architecture—based on the challenges that face Digital Government development today and from the architectural perspective. New regulations and contemporary technologies will have increasing influence over future interactions, specifications, new services, and enhancement of existing services Giorgi and Hauptman (2007). Furthermore, this study aims to investigate what has been documented in the literature as the main components or architecture building-blocks for the establishment of a Digital Government infrastructure.

In the corpus of Digital Government research literature, there is a dearth of examples of reviews on Digital Government architecture. This is due in large part to the fact that Government Architecture (GA) is a relatively new discipline in which core concepts are only gradually emerging Janssen et al. (2013). As a result, there has been relatively scant attention from researchers on investigations of the causal factors behind the failures of many Digital Government projects in developing countries. In this regard, Dada (2006) conducted a literature review exploring the reasons why many Digital Government projects fail in developing countries. This literature review provides a foundation for our study by demonstrating a relevant background for practitioners and those involved in the implementation of Digital Government applications. This research employs Heeks (2003) 'archetypes of failure', which refers to gaps between the design of the technology and the reality of the context using some of the contemporary literature. This research does not

attempt to investigate the challenges from an architectural perspective. Digital Government implementation is an ongoing process, and its development is conceptualized in stages Almarabeh and AbuAli (2010).

Accordingly, researchers are increasingly aware of how architecture is essential to the conceptualization of Digital Government development (Agarwal et al. 2017; Cellary and Strykowski 2009; Peristeras and Tarabanis 2004) and in establishing government-wide guidelines to develop ICT infrastructure Azad et al. (2008). Case studies demonstrate that the use of appropriate architecture can lead to the successful facilitation of Digital Government initiatives and strategies Martin et al. (2004). In reviewing various Digital Government literature, it becomes evident that architecture is used to guide design decisions Janssen and Kuk (2006).

Review of Literature

A study was conducted by Moreno et al. (2014) to examine some of the developed enterprise architecture for government in various countries, including Korea, the USA, Canada, Spain, Australia, Brazil, the UK, and Colombia. The review presents a comparison of the architecture domains used in each framework. The primary objective of the study is to create the Colombian Government Enterprise Architecture Framework and to establish its principles, standards, and guidelines. This study outlines the Colombian Government Enterprise Architecture Framework principles, which are citizen service excellence, an investment with a reasonable cost/benefit ratio, rationalization, standardization, interoperability, feasibility on the market, technological neutrality, and federation. This study merely provides a set of principles, guidelines, and standards, and does not present the architecture itself nor the associated components. At the higher stage of Digital Government evolution, the problem of interoperability arises and becomes one of the main obstacles of further Digital Government development Cellary and Strykowski (2009).

Therefore, the study of interoperability in Digital Government has increased in recent years, and researchers are developing interoperable architectures for Digital Government (see for example (Marques et al. 2011; Sedek et al. 2014; Luna-Reyes et al. 2012; Paul and Paul 2012; Guijarro 2007)). Accordingly, Sedek et al. (2011) conducted a systematic literature review on the topic of interoperable architecture for Digital Government portals, published within 2001–2011. As revealed in the findings of Sedek et al., Service Oriented Architecture (SOA), a one-stop portal service center, semantic web services,

integrated and interoperable Digital Government, and layered architectures are the most common current Digital Government architectures. However, several other studies report enterprise (Agarwal et al. 2017; Rehman and Shamail 2014; Moreno et al. 2014; Janssen and Cresswell 2005), hybrid and distributed (Sedek et al. 2013; Meneklis and Douligieris 2007), decentralized Ye et al. (2013), and multi-agent-based (Usman et al. 2006; Zeeshan Ali Ansari and Imran Khan 2008; García-Sánchez et al. 2008) architecture as well, which are not addressed in the study by Sedek et al. The authors found that the majority of Digital Government architecture implements G2G and G2C, and most of them (59%) adopt Service Oriented Architecture or Web Services. However, the authors claimed that the architecture analyzed lacks detailed descriptions concerning structural and extra-functional properties. Thus, further investigation and precise formulation are required to produce an architecture capable of achieving a high level of interoperability and reliability. The review demonstrates how most Digital Government architecture achieves higher integration (including horizontal or vertical integration) maturity but not in the area of interoperability. The review addressed the quality attributes of architecture, which are security, reliability, usability, and performance.

Helali et al. (2011) conducted a study of Digital Government architectures in 2011, where they concentrated on the architectural design of the Digital Government from the software engineering perspective. The study focused on architectural design principles, the high level of software components that constitute the architecture, and the related technology. The authors investigated several Digital Government architectures or best practices that are built in different contexts including architecture for mobile government Gouscos et al. (2005), Geneva State Digital Government Sandoz (2009), one-stop government portal architecture Gugliotta et al. (2005), the architecture of a European e-government Project Glassey (2002), and European Commission e-mayor project (e-mayor, 2004) Kaliontzoglou et al. (2007).

The findings show that only three out of seven architectures, use specific architectural standards that permit better reuse of design principles. The results reveal a set of principle features or architecture attributes that are essential for designing a Digital Government architecture. These characteristics are grouped into intrinsic characteristics, namely, interoperability, flexibility, compatibility, traceability, symmetry, cross-border characteristics, scalability, legality, cost consideration, and easy to learn, and extrinsic characteristics, namely, privacy, accessibility, transparency, mobility, and responsibility. These

characteristics will enable us to conduct a comparative analysis of contemporary Digital Government architecture presented in recent years. However, this study neither evaluates the quality of the architectures nor defines the common high-level components that constitute the Digital Government architecture. Similarly, Dang and Pekkola (2017) conducted a systematic literature review on Enterprise Architecture (EA) in the public sector. The authors claim that the EA concept has received significant attention from public sector actors around the world, and most public sector EA studies (56.25%) focuses on EA development. However, the study recommends that further research is required concerning EA to address some problems associated with EA research and governance structure, EA management, and security. The authors have not addressed any other architectural style nor compared the existing EAs. European Union completed a pan-European project Electronic Simple European Networked Services (e-SENS) in 2017 by involving 100 public and private actors from 22 Member State countries NRW Ministry of Justice NRW Germany (2015).

This project aimed to promote interoperability and the deployment of cross-border digital public services through generic and re-usable technical components, based on the building blocks of the Large Scale Pilots (LSP). e-SENS introduced consolidated building-blocks with a strong focus on e-ID, e-Documents, e-Delivery, Semantics, and e-Signature based on the achievement of previous Large Scale Pilot projects (e.g., PEPPOL on e-Procurement, eCode on e-Justice, STORK and STORK II on e-ID and e-Signature). e-SENS supports the implementation of various EU policies and promotes reaching compliance with Digital Government related legislation such as eIDAS. The result of this project has also gained attention outside Europe. Various countries such as Australia, Canada, Malaysia, and Singapore are interested in possibly reusing e-SENS solutions for their requirements EU European Commission (2020b). The result of this project has been handed over to further EU digital services programs such as Connecting Europe Facility (CEF)—CEF digital 2018 Wisniewski et al. (2016)—and The Once-Only Principle (TOOP). This transition aimed to ensure that no knowledge or experience from the e-SENS project is lost, and the building blocks remain sustained as stable components of Europe's digital ecosystem. CEF EU European Commission (2020a) provides support and guidance to an interoperable EU-compliant digital solution. CEF added some new building blocks (e.g., e-Invoicing, e-Translation, e-Archiving, Context Broker) to facilitate secure cross-border digital interactions between citizens, businesses, and public

administrations. The TOOP project started in 2017 to ensure that public bodies take action to share data, and citizens and companies supply certain standard information only once to a public administration NRW Ministry of Justice NRW Germany (2017). TOOP aims to provide a generic federated architecture that can connect different registries containing base data and Digital Government architectures in various countries by applying standards Krimmer et al. (2017). Thus far, various European countries have started to implement TOOP at the national level, but its cross-border implementation is still fragmented and limited Tepandi et al. (2019).

European Interoperability Reference Architecture (EIRA) EU European Commission (2019) is a reference architecture with a specific focus on the interoperability aspects of digital public services in Europe. It is not the intention of the EIRA to provide a comprehensive end-to-end guide to all building-blocks to be considered for the design of any system. EIRA follows Service-Oriented architectural design, covering the structural, behavioral and governance aspects of an interoperable digital public service in alignment with European Interoperability Framework (EIF). EIRA does not address the other architectural building-blocks that they do not focus on the interoperability. We believe EIRA is a relevant architecture to be discussed here. Even though it is not scientifically proven yet in a form of peer-reviewed publications. While the reviews presented to highlight the growth in Digital Government architecture, there remain knowledge gaps concerning contemporary Digital Government architectural characteristics, challenges, and the main components or architecture building-blocks for establishing a Digital Government infrastructure. Governments across the globe have developed their own forms of Digital Government architecture, based on the specific requirements of their countries. Hence, the purpose of carrying out a detailed systematic literature review is to analyze the existing Digital Government architectures to identify the documented primary Digital Government architecture characteristics, challenges, and the key architecture building blocks that constitute Digital Government architecture at the infrastructure level.

Electronic governance (e-governance) is the application of information and communication technology (ICT) to provide government services to citizens, organisations and government digitally (Iyer and Rao, 2017; Joseph, 2017; Heeks, 2004; Gupta and Jana, 2003).

E-government comprises strategies and course of actions; carried out through person, substantial technology and procedures. Since 1970s, e-governance initiatives were successfully implemented and achieved new growth level in the

developed and developing countries. But there is an immense difference in growth achieved by both type of countries (Liu et al., 2017).

In the current scenario, according to the OECD (2015) and WEF (2016), developing countries are far lagging behind the developed countries. However, there is an improvement in developing nations from 2000 to 2015 with the help of their pouring factors (Berrío-Zapata and Berrío Gil, 2017).

In this research, the implementation of e-governance and their driving factors are reviewed. These driving factors are classified into five categories to review their role in depth. It is proved through evidences realised by the implementation of e-government that it is very beneficial for the developed, developing and least developing countries, in other words, beneficial for both rich and poor nations alike (Colesca, 2015; Kettani et al., 2009). E-government is an exclusively authoritative and imperative tool for cities in developing countries, which are facing numerous challenges like deprived public services, redundancy, housing, corruption and ferocity, fitness, edification and these challenges will only grow arduous as cities grow (Lupu and Lazăr, 2015).

In the United Nations E-Government Survey 2014, it is mentioned that e-government could provide us the future that we want, particularly in this multi-faceted and complex scenario that societies are facing today. Hasan (2003) stated that E-Governance assists in increasing the productivity, usefulness of government performance. Through this review research, the interested researcher has a wide scope of research in this area and to find research gaps where future research could be done. E-governance is not intended only for hosting or exploring high-tech tools, it primarily attempts to bring out a revolution in approach and work culture to assimilate government processes and functions to assist the nation's progress (Al-Hossienie and Barua, 2013; Sadashivam, 2010).

The emergence of e-governance has been one of the most prominent expansions of the web. Global shifts towards increased deployment of Information Technology. Today the development of any nation depends on the uses of e-governance and their permeation (Qian, 2011; Dawes, 2008; Ndou, 2004; West, 2004). This research presents the literature review in the area of E-Governance using classification approach. In this research, e-governance implementation supporting factors' literature is classified into five categories. First of all education level/services are discussed. User's acceptability and awareness towards E-Governance are reviewed. Additionally, Legal and policies are discussed, which includes economies; development and benchmarking of e-government successful growth in various nations.

Further, digitalisation in countries has been reviewed along with the infrastructure of the countries to support e-governance. As all these categories are the major contributing factors essential for successful implementation of e-governance (Gupta et al., 2017; Joseph, 2017; Beaumont, 2017).

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