Towards service integration in electronic government implementations

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Abstract— Service integration is one of the most critical issues affecting electronic government implementations all over the world. Providing integrated services to citizens, businesses, and all other stakeholders involved in electronic government activities at "one stop portal" is considered to be a big opportunity for governments to improve their services' efficiency and effectiveness. This paper aims to provide a general background and theoretical foundation towards understanding the role of service integration and its importance in electronic government implementations in order to achieve the main aims and objectives of electronic government programs all over the globe by conducting a comprehensive literature review on electronic government, in general, and the issue of service integration in particular. The paper has shed a new light on the main concepts, definitions, characteristics, interactions, models, objectives, benefits, challenges and analytical bases for the topic. As a result, a model that is suggesting a set of key factors to accomplish service integration in electronic government implementations and clarifying the importance of service integration in electronic government implementations is proposed. The main contribution of the paper is to build a good understanding of the nature and role of service integration in electronic government implementations and to establish a foundation for further research in this domain.

Keywords— E-government implementation; Service integration; Maturity models; One stop portal; Pillars; Critical factors;

I. INTRODUCTION

In order to provide customers with fast and handy services and to be more competitive in the information era, the private sector has adopted what is known as electronic commerce by utilizing the benefits of information and communication technologies and its available tools, especially the internet. As a result, the demands and requests of citizens to their governments to provide public services with the same level as the private sector efficiency and effectiveness encouraged governments to adapt the ready-made models established by the private sector and reapply them to the public sector to produce what is known as electronic government [1][2][3][4][5]. Many researchers have dealt with the electronic government subject in order to understand and explain its main concepts, definitions, characteristics, interactions, models, objectives, benefits, challenges and analytical aspects in order to build a clear understanding and concrete foundation for its successful implementation.

Therefore, the focus of this paper is to understand the importance of service integration and its role in electronic government implementations and to build a model that illustrates the key factors affecting service integration in electronic government implementations. In addition to the introduction section, this paper will be structured under the following major headings: electronic government section introduces the topic and discusses the characteristics, objectives, benefits, challenges and analytical aspects of the electronic government. Service integration section discusses maturity models and the role of service integration in electronic government. It also produces a model that clarifies the key factors affecting service integration in electronic government implementations. Finally, a brief conclusion to summarize the content and findings of the paper is presented.

II. ELECTRONIC GOVERNMENT

The concept of electronic government received several definitions in the literature, some definitions are limited and consider one or two aspects of electronic government while others are broad and consider more aspects. Moreover, some definitions reveal only one or two stakeholders' perspective while others reveal broader perspectives. A simple and limited definition of electronic government is the one introduced by [6] that defines electronic government as online delivery of government information and services using digital means. This definition ignores the multi-view perspective of diverse groups of stakeholders involved in electronic government activities on one hand and ignores the wide range of electronic government aspects through only focusing on the technological dimension on the other hand. The Organization for Economic Cooperation and Development (OECD) provided the following simple and limited definitions [7]:

- Internet service delivery and other internet-based activities provided by government.

- All uses of information and communication technologies by government.

- Transforming public administration using information and communication technologies.

- The use of information and communication technologies, particularly the internet, as a tool to achieve a better government.

The definition suggested by UNESCO considers electronic government as the public sector's use of information and communication technologies to improve delivery of information and services, improve decision-making by encouraging citizen to participate and improve the accountability, transparency and effectiveness of the government itself [8]. It is clear that this definition takes multi-view perspective into account and sheds the light on more aspects such as managerial, political and technological. However, it still does not cover all aspects and characteristics of electronic government.

A more comprehensive definition identify electronic government as the term that refers to the use by government agencies of information technologies (such as Wide Area Networks, the Internet, and mobile computing) that have the ability to transform relations with citizens, businesses, and other arms of government. These technologies can serve a variety of different ends: better delivery of government services to citizens, improved interactions with business and industry, citizen empowerment through access to information, or more efficient government management. This result is increased transparency, less corruption, more convenience, revenue growth, and cost reductions [9].

The characteristics that can be extracted from these definitions summarized below:

- It is a transformational process from the old traditional procedures into new electronic procedures in governments.

- It involves the automation or computerization of existing paper-based procedures using information and communication technologies.

- It focuses on the use of internet as a primary tool of information and communication technology to support electronic government activities.

- It includes all governmental operations conducted in different governmental agencies.

- It includes all governmental services offered to various stakeholders that include citizens, businesses and other governmental agencies.

- It can provide information and services online from any place at any time.

- It can provide more convenient access to government information and services.

- It can improve information and service delivery by time saving and cost reduction.

- It can provide new ways to enhance relationships and increase positive interactions between governments and their citizens.

- It can improve accountability, transparency and citizen empowerment by allowing wider participation in government policy shaping and decision making process.

The various definitions focus on three main target groups of stakeholders engaged in electronic government activities: citizens, businesses and governments themselves [10]. In electronic government, all processes are conducted and all stakeholders are connected through information and communication technologies in order to reach better government. Hence, electronic government transactions can be classified into four types [11]:

1) Government-to-Government (G2G): aims to manage relationships and administer connections between various government organizations to behave as one department by allowing them to share information and resources in order to create cooperation, coordination and transparency among them. Thus, they will be able to interact with citizens and businesses effectively. Examples of G2G include: inter-agency payments, procurement, and standardized forms.

2) Government-to-Business (G2B): aims to manage relationships with the private business sector by providing them with all information and services they need from the government organizations, to be able to participate and support the development of national economy, which will in turn allow a country to keep in line with global economies. Examples of G2B include: start-up of a new company, procurement, taxation, and licensing.

3) Government-to-Citizen (G2C): aims to manage relationships and interactions with the citizens by providing them with all information and services they need from the government organizations in order to build trust between government and citizens. Examples of G2C include: paying bills and formal documents renewal.

4) Government-to-Employee (G2E): aims to manage relationships and interactions with government employees by improving all intra-government transactions and processes needed by them. Examples of G2E include: e-payroll and e-training.

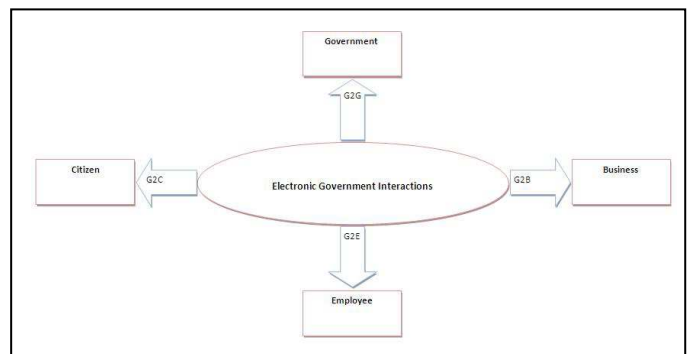Figure 1 shows the types of transactions between stakeholders in electronic government.

Fig. 1. Types of transactions between stakeholders in e-government.

The goals of the electronic government implementation could be summarized in the following points: transforming the shape of government from the traditional into electronic [12], supporting economic policy and modernization of the administrations [10], improving relationships between

government and citizens or businesses [13], delivering value-added government services to all involved stakeholders, enhancing interactions with business and industry, improving efficiency of government management, supporting citizen empowerment through access to information and participation in decision-making [14].

By achieving the aforementioned objectives, governments will be able to gain a set of main benefits provided to all involved stakeholders in electronic government activities such as delivering electronic and integrated services in one stop portal, bridging the digital divide to use electronic government services, achieving lifelong learning by the widespread of electronic learning tools, rebuilding government-citizen relationship, increasing economic development, creating more participative form of government [15], providing more accessible, more convenient, more responsive and more cost effective services, making governments more open, more accountable, more inclusive and better able to lead their communities, promoting local economy vitality through a modern communications infrastructure, developing a skilled workforce and improved employability of the citizens [16], reducing corruption, increasing transparency, providing greater convenience, improving revenue growth, and supporting cost reductions [14].

However, achieving the major objectives and gaining main benefits are not the only requirements for reaching successful electronic government. There is a need to overcome a set of critical challenges or obstacles such as Infrastructure development, law, digital divide, e-literacy, accessibility, trust, privacy, security, transparency, interoperability, record management, permanent availability, education, marketing, public-private competition or collaboration, workforce shortage, cost structure, benchmarking [17] [18]. These challenges can be categorized under the following areas: information and data, technical and technological, organizational and managerial, legal and regulatory, institutional and environmental [8] [19], financial and economic [1] [20] and service integration [21] [22] [23].

A new study by [14] points out that governments lag behind when compared to businesses and individual readiness to participate in electronic services due to a number of significant obstacles and weaknesses that hinder the expansion of electronic government services to becoming fully integrated. These weaknesses can be categorized into strategic, technological, organizational, policy, legal, human factors, security threats, volume of online users and online payment methods.

It can be seen from the above discussion that successful electronic government is the implementation that is able to meet the overall objectives of electronic government on one hand and exploiting its potential benefits on the other. At the same time, electronic government has the ability to overcome all kinds of obstacles and challenges that might hinder its progress towards achieving its major goals and objectives. Today, it is clear that electronic government applications are designed based on the aforementioned principles and successful implementations of e-government are those

achieving more benefits and overcoming more challenges where service integration role is critical.

III.   SERVICE INTEGRATION

Reference [24] defines service integration as the most sophisticated level of electronic government in which government services are integrated together. The required services are accessible from all involved people in electronic government activity regardless of the department or governmental agency producing them.

Another definition proposed by [22] defines service integration as the combination of different services from separate departments; this may range from clustering of common services to become one unified service to a seamless service oriented around user services, where a "one-stop" portal is a single entry window allows an individual users to choose from a full list of personalized services to their specific profiles.

The aforementioned definitions of service integration emphasis on many key issues that need to be taken into consideration when applying service integration to electronic government implementation in order to guarantee efficient, effective, competitive and integrated services are delivered through government official portal. Major issues in this regard include availability, accessibility, personalization and customization, cooperation and coordination, and 'one stop' portal [25]. Moreover, association of existing systems and databases in governmental agencies is highly required in addition to a certain level of intra-departmental collaboration and harmonization. It is clear that service integration supports all efforts to remove or eliminate boundaries between services delivered by multiple divisions or departments. However, service integration as a process can take place within a single governmental agency provides multiple services or between separate governmental agencies providing interconnected services [26].

In line with this view, taking the main characteristics of service integration mentioned above in consideration, the following definition of service integration can be suggested: The combination of all government electronic services provided by all governmental agencies to all parties involved in electronic government activities throughout an official main portal with a single entry point available for everyone from anywhere at any time.

The definition reveals the following three main components: service provider, service receiver and the channel to deliver the service. For example, concerning public e-service, government organizations and agencies are the service providers and citizens as well as businesses are the service receivers. The main channel of electronic service delivery is the internet while other traditional channels such as telephone, call center, public kiosk, mobile phone, and television are also considered. As a result, all government electronic services have to be integrated and combined together at one place.

To show and illustrate the stages of electronic government's growth from the immature to the mature, a wide range of maturity models have been proposed by researchers

and practitioners in the field of electronic government. Those models can be seen as a road map that helps in successful implementation of electronic services efficiently and effectively on one hand and in evaluating the overall progress of electronic government projects on the other [27]. Generally, the first stage is publishing where governments provide information to citizens through static web pages (one way communication), and the second stage is transaction where government exchange information with citizens through dynamic web pages (two way communication), and the final stage is integration where all information and services are provided online at 'one stop' [28] [29]. Table 1 which presented and discussed by [30] shows examples of the most well-known maturity models where the first column is the name of the model, the second column is the number of stages or phases suggested by each model to be implemented in order to complete electronic government lifecycle and the third column is the year of introduction.

TABLE I.   MATURITY MODELS

Model Name	No. of Stages	Year
World Bank	3	2002
Howard	3	2001
Gartner	4	2000
Layne and Lee	4	2001
West	4	2004
Chandler and Emanuels	4	2002
Public Process Rebuilding (PPR)	4	2006
Siau and Long	4	2005
Moon	5	2002
Accenture	5	2003
United Nations (UN)	5	2001
National Audit Office (NAO)	5	2002
Deloitte	6	2001
Asia Pacific	6	2002
6I	6	2008
Klievink and Janssen	5	2009

Despite the fact that the aforementioned maturity models have diverse numbers of stages for achieving successful electronic government, the ultimate goal of all these models is the integration of government services provided by different government agencies for different functions and at different levels of the government system [31] [32]. It is clear that service integration is a critical success factor to reach a mature

stage of electronic government and to achieve its overall goals and objectives. Therefore, the objectives of electronic government will be accomplished only when full service integration is implemented.

It is important to give more attention to the role of service integration when making plans and decisions regarding electronic government strategies and implementations. Electronic government policy makers need to consider the importance of service integration through understanding its multifaceted roles in electronic government and also need to consider the overall objectives, benefits, challenges and maturity stages of electronic government to highlight the location of service integration on electronic government map and how it can supports the overall development and progress of electronic government projects.

As a result of reviewing the literature and previous studies on service integration in electronic government implementations, we extract a set of principles and criteria for successfully implementing service integration. We call these principles and criteria pillars of service integration in electronic government implementations.

The first pillar in our model is availability. According to [30], a successful implementation of service integration requires availability of integrated services which refers to the ability of electronic government portal to provide designated integrated services at one stop whenever required to all stakeholders involved in electronic government interactions with no need to know the details behind integrating services among different governmental agencies. In line with this view, concepts such as cooperation, collaboration, association and coordination of all governmental agencies responsible for providing integrated services at one stop are key factors to accomplish successful integration of services in electronic government implementations. Thus, the second pillar in our model is consistency where a higher level of consistency between data, information and systems is needed to ease the development of successful service integration.

Moreover, the third pillar in our model is accessibility of integrated services to all potential kind of users regardless of their level of education or knowledge in the internet and computer skills [25]. It is the ability to obtain designated integrated services from anywhere at any time by anyone. This concept reveals the importance of security issue which is the forth pillar in our model. Therefore, we can highlight two major security issues: authentication and authorization. Authentication provides tools to verify user's identity through guarantee that the entity accessing the electronic government portal is what or who it claims to be while authorization provides tools to grant or deny a user to accessing all or some information or services on electronic government portal. Authentication and authorization support the idea of privacy and confidentiality through restricted access to user's data and profiles by designated specific authorities [33].

Reference [32] focus on the concept of customization to refer to personalization and individualization of integrated services provided through electronic government portal according to users' profiles such as the ability to automatically filling in forms and downloading selected documents or

applications based on users' preferences. That's why we selected customization as the fifth pillar in our model.

The sixth pillar in our model is reliability as many researchers give emphasis to it as a critical issue to ensure efficient and effective delivery of integrated services at 'one stop'. One of those researchers is [26] who mentioned reliability without degradation or failure to express the ability of the electronic government portal to consistently perform its functions and offer its services to all kinds of stakeholders when required without degradation or failure. In line with this view, the term of maintainability can be highlighted to signify the ability of the electronic government portal to preserve its original state and the ability to be restored in case of a failure. Moreover, maintainability refers to characteristic of design and installation which determines the probability that a failed equipment, machine, or system can be restored to its normal operable state within a given timeframe based on a set of prescribed practices and procedures. Consequently, maintainability is our seventh pillar that has two main components: serviceability which is ease of conducting scheduled inspections and servicing, and reparability which is ease of restoring service after a failure [33].

The eighth and last pillar in our model is usability. Reference [34] stated usability as one of the main principles for achieving successful service integration. While it can provide ease, speed, and intuitiveness in operating or using the electronic government portal to offer all kinds of integrated services to all users involved in electronic government interactions, usability arises from a combination of well thought-out architectural and design factors, and interpreted as user's ability to perform tasks efficiently and effectively with regular effort [33].

It is clear that all the above pillars have critical impacts on the implementation of service integration in electronic government implementations and they must be taken into consideration in order to achieve successful service integration. Figure 2 demonstrates our model and shows the main pillars of service integration in electronic government implementations in addition to major critical factors affecting them.
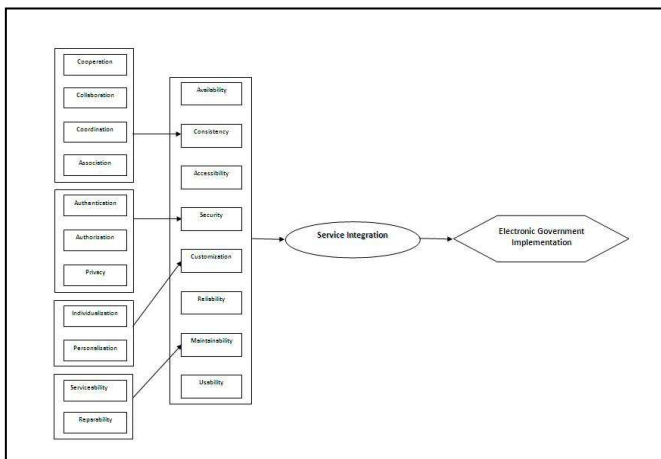

Fig. 2. Pillars of service integration in electronic government implementations.

IV. CONCLUSION

This paper presents a general background and provides a theoretical foundation about the role of service integration and its importance in electronic government implementations. This aim is achieved through a comprehensive literature review of electronic government in general and the issue of service integration in particular where a new light has been shed on the main concepts, definitions, characteristics, interactions, models, objectives, benefits, challenges and analytical bases of the topic. As a result, the main contribution of this work is suggesting a set of main pillars and key factors playing a significant role to accomplish service integration in electronic government implementations by proposing a model that explicates eight pillars and explains its importance. These pillars are availability, consistency, accessibility, security, customization, reliability, maintainability and usability.

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