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E-Government Information Systems Interoperability in Developing Countries: The Case of Jordan

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ABSTRACT

Objective: This study examines the factors that influence information system (IS) interoperability of e-Government focusing on IS Interoperability as the key concept to reach successful e-Government implementation in Jordan.

Methodology: Use of qualitative methods of inquiry has been made to explore study variables and their relationships. A variety of published literatures related to scope of the study has been reviewed along with analyzing the e-Government strategy in Jordan during period 2014-2016. The interoperability levels of e-Government IS have been discussed in this paper. Finally, significant barriers that affect IS interoperability have been identified along with the factors that can drive it successful implementation.

Findings: Technical, semantic, and organizational interoperability are main stages for successful e-Government IS interoperability. Information and Communication Technology (ICT) infrastructure, top management support, human resources, data and information, security and privacy, and business process have been found as the major obstacles. Whereas, high level interoperability goals, commitment of government bodies, and customer focus have been identified as main success factors that lead to e-Government IS interoperability. The study suggests that strategies and work process should be aligned, common standards and knowledge should be shared to move towards e-transformation in Jordan.

Implications: This study can be starting point for the real life practical solutions for successful implementation of e-Government conceptual frame work. Finding of the study can be used to generalize about the factors that lead to success of IS interoperability within government agencies in other developing countries. This study enriches existing literature in this context. On practical side, the study contributes by identifying IS interoperability success factors and barriers within government agencies. The proposed conceptual model is first stage in the process of understanding factors that influence e-Government IS interoperability. Further studies may be needed to empirically evaluate the proposed conceptual model.

1. Introduction

The term electronic government (e-Government) can be defined in many ways. Gil-Gracia and Pardo (2005) define it as the intensive use of information technologies for providing public services which may lead to improvement of managerial efficiency, promotion of democratic values and the working mechanisms. Ahmed, Alhadi, and Seliaman (2015) define e-Government as the utilization of the information technology, and especially the internet, to improve the government services delivery to citizens, businesses, and other government agencies. It can be defined as the use of ICT to provide the public sector services to the citizen and business. That means the using of recent and advanced technology such internet and mobile technology to provide the citizen and business with improved better and government services (Pardo & Tayi, 2007).

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Information Technology (IT) has played critical role in supporting organizational change programs. E-Government has been implemented in many countries as the most fundamental infrastructure for delivering government services (Ahmed, Mehdi, Moreton & Elmaghraby, 2013). Currently, developing countries are also following the developed countries and trying to adopt e-Governments systems. Accordingly, e-Government initiatives are becoming main goal of governments to reform and renovate governance in many developing countries (Al-Naimat, Abdullah, Osman & Ahmad, 2012).

Jordan, as one of the developing countries, started e-Government program in 2003. The main aim of this program has been to deliver public services to the citizens across nation regardless of their location, education, economic status or ICT ability. It is expected, furthermore, that Jordan's economic and social development can be enhanced due to e-Government as well as transformation into a competitive, innovative and knowledge based society (Al-Shboul, Rababah, Al-Shboul, Ghnemat & Al-Saqqa, 2014). This can be reached by integrating government resources, increased citizens' participation in local economic development and easier citizens' access to government services leading to less government control and more citizen empowerment over public data. E-involvement and e-Government participation by all is essential for social empowerment and economic development for all citizens through ICT (Majdalawi, Almarabeh, Mohammad & Quteshate, 2015).

E-Government in Jordan mainly focuses on four types of interactions between government and stakeholders. These interaction types are described as follows (Jordan e-Government, 2013).

- **Government-to-Citizen (G2C):** Delivering electronic services from government entities to citizens such as licenses renewing, taxes/billing and payment etc.
- **Government-to-Business (G2B):** This refers to delivering public services to businesses through electronic channels. Exchanging electronic data between government and businesses through these interactions (e.g. e-procurement, customs and importing/exporting goods services).
- **Government-to-Government (G2G):** Data and information exchanging within the Governmental entities and within government internal entities via available network communications through secure government network (SGN).
- **Government-to-Employee (G2E):** The transactions from government to its employee through governmental Management information systems (e.g. human resources information systems).

To achieve e-Government aims, there is a need to connect Government and its stakeholders internally and externally (i.e. G2C, G2B, G2G and G2E). The key concept to ensure that e-government systems are well connected is interoperability (Pardo & Burke, 2008). According to Lallana (2008), interoperability can be defined as the ability of different types of information and communications technology (ICT) systems to work together in order to exchange data and information efficiently in a meaningful and useful manner.

Implementing any e-Government project aims to deliver electronic services to citizens, business and to the government itself (Al Hujran, Aloudat & Altarawneh, 2013). In order to reach this aim, the government in Jordan needs to focus on improvements in various areas such as IT infrastructure, common services, on-line, multiple channels and one stop service delivery to enhance service delivery in an effective and efficient way. Furthermore, government should taking into consideration the confidence and satisfaction of government customers, both citizen and business, through transparency, cost reduction and easy access to government services. Moreover, reaching interoperable information systems between the e-Government agencies should focus on the factors that affect its performance such as availability, reliability, standardization, flexibility, response time and integration (Ornager & Verma, 2005).

The interoperability of e-Government information systems is influenced by many factors such as administrative support, clear strategy, IT skills, security and privacy, IT infrastructure, and trust to use the services delivered through e-Government channels. Any deficiency in these factors work as obstacles that prevent e-Government implementation success and prevent the delivery of e-services projects (Al-Shboul et al., 2014). It is important to study the interoperability of information systems between various government agencies and investigating how information systems interoperability enhances the delivering of services to customers. Also it is vital to identify the barriers towards IS interoperability and how these influence the successful implementation of e-Government projects.

With this background, this study answers the question: what are the factors that influence e-Government IS interoperability implementation in the Jordanian governmental institutions? The aim of this paper is to present government-centered cooperative architectural model of e-Government that defines and guides about

establishing technical interoperability within context of e-Government system in Jordan. Specifically, the study aims at following objectives.

- To identify stages of e-Government IS interoperability that may lead to the successful implementation of e-Government initiatives.
- To indicate the factors which influence the implementation of e-Government project in Jordan namely political, social, technological and organizational.
- To suggest the recommendations that can enhance IS interoperability in e-Government project in Jordan.

2. Literature Review

Review of important factors that affect e-Governement interoperability identifies IS Interoperability as important influencer of e-Government implementation success. Many approaches are used in e-Government program to improve IS interoperability based on the level of implementation of e-Government program namely technical, semantic, and organizational levels (Tambouris, Loutas, Peristeras & Tarabanis, 2008).

Detail of these approaches of IS interoperability is described below.

2.1. Technical Interoperability

It is considered as the starting point for achieving e-Government interoperability. Technical interoperability includes data common standards, data schema, data accessibility, applications, existing technology such as hardware, security, privacy, networking and communication. These elements are usually classified among the most important ones for building technical interoperability (Hellman, 2010; Solli-Saether, 2010). When exchanging data, agreed format of messages and communication protocols should be clear within government entities (Lee, Yee & Cheung, 2009).

2.2. Semantic Interoperability

This refers to combining the data that is received from other government entities into internal databases and information system, data processing and changing it into meaningful information to be used in a given context (Hellman, 2010; Solli-Saether, 2010). It also includes specifying common data definitions with high degree in a certain area; developing knowledge management systems, information and business models, and service catalogues. Agreement on information types and their definitions should be done during transmission phase (Lee et al., 2009).

2.3. Organizational Interoperability

This level of IS interoperability is more sophisticated requiring collaboration between government organizations to achieve organizational interoperability. Information architectures need to be aligned with the organizational goals to make its services available and accessible to citizens in order to achieve social and economic benefits (Hellman, 2010; Solli-Saether, 2010). To facilitate daily work of government organizations, the data that received from other entities should be combined with internal information systems and databases to deliver services to public. This in turn enhances productivity and enables reaching organization goals. Adoption of new services affects business activities, which should be agreed upon with other stakeholders during this phase (Lee et al., 2009).

3. E-Government IS Interoperability: Conceptual Framework

In order to propose the framework, this paper focuses on barriers that are affecting IS interoperability and identifies the drivers that lead to successful implementation of e-Government program. First, this section discusses the barriers that affect IS interoperability followed by the success factors that should be applied to reach the full IS interoperability.

3.1. Barriers Affecting IS Interoperability

The main obstacles that are faced during IS Interoperability of e-Government program can be listed below:

- **ICT infrastructure:** It has been stated in literature as one of the main obstacles that prevent information sharing, electronic readiness, communication between stakeholders which in turn affects IS Interoperability and online service delivery (Kayani, Iqbal & Humayun, 2011; Melitski, Carrizales, Manoharan & Holzer, 2011; Ndou, 2004; Paul & Paul, 2012; Solli-Saether, 2010). Developing countries are facing many problems in deploying suitable ICT infrastructure. In order to gain maximum benefits from e-Government projects, appropriate ICT infrastructure development is required from the government with up-to-date and latest technology within ICT sector.

- **Top Management Support:** It is considered as the critical factor when starting new projects. Focusing on real cost and benefits are the concerns of the top management during the planning phase of any new e-Government projects. Their support through motivating, influencing and leading before, during and after the project management phases is critical and lacking its presence therefore becomes major barrier. Funding, support, concept explaining and awareness from top management comes before beginning of the project, whereas management support by top management to control any changes comes during e-Government implementation. The role of top management increases even after the project is finished in order to support smooth working and ensure that the project is on the right track (Melitski et al., 2011; Ndou, 2004; Roberg & Myrseth, 2014; Sohimi & Abbas, 2011). All phases of e-Government projects are influenced by top management support to ensure that these projects start, deployed, and implemented within the specified framework. Top management coordination between different governmental organizations facilitates organizational level IS interoperability, and minimizes the gap between these organizations.

- **Human Resources:** Lack of ICT skills in the government sector can be considered as one of the challenges of IS Interoperability. Lack of qualified and well-trained HR in the ICT sector is indicated as the main problem faced by developing countries. Success of IS interoperability in e-Government program depends largely on the availability of appropriate ICT skill in the government. Multi skills human resources are needed for analyzing, designing, installation, implementation and maintaining ICT infrastructure as well as managing online e-services. (Hellman, 2010; Melitski et al., 2011; Ndou, 2004). Human resource initiatives for knowledge management are required to boost ICT training through education and workshops in order to raise IT skills for HR to achieve IS interoperability of e-Government programs. HR policies to motivate skilled persons and prevent them from leaving job are also needed in order to reach a sustainable IT environment in government sector.

- **Data and Information Integration:** Data integration facilitates data and information exchange within different government organizations and is classified as important factor in IS interoperability. Data integration is affected by common data definitions, data maintenance, and information management within organization and with other governmental entities (Kadadi, Agrawal, Nyamful & Atiq, 2014; Paul & Paul, 2012; Petter, DeLone & McLean, 2008; Solli-Saether, 2010). Data integration depends on information standardization using common data and unified database concept management systems. Standardized guidelines are considered useful ways for reaching e-Government interoperability. Data inconsistency and information quality are considered as major challenge for data and information integration (Klischewski & Scholl, 2006; Ye, Li & Hu, 2011).

- **Security and Privacy:** Different governmental institutions still have low trust in information system sharing due to the privacy and fairness from security breaching (Kayani et al., 2011; Sohimi & Abbas, 2011). Applying security standards, penetration tests, and privacy roles lead the government organizations towards sharing data among themselves and increased IS interoperability at organizational level.

- **Business processes:** Delivery of government services to citizens passes through various operational procedures and cross department communication also defined as cross-agency services. Some processes involve many governmental entities in order to deliver the service (Paul & Paul, 2012; Solli-Saether, 2010). Enhancing e-Government interoperability could be done through business process reengineering to exclude wasteful components arising from business duplication. Business process IS interoperability improves the government entities' response to the new and existing service delivery requirements. This is made possible by development of common understanding of business

requirement and business processes management. This leads to enhanced collaboration within governmental entities through e-Government IS interoperability achieved by business process reengineering (Stemberger & Jaklic, 2007).

There are other challenges such as leadership styles, financial support, cultural attitudes, bureaucracy and customers' needs which influence IS interoperability of e-Government programs (Gichoya, 2005; Nduo, 2004). Overcoming these challenges is possible through technological change, rising customer satisfaction, clear strategies, governmental support, and external support (Gichoya, 2005). Social factors are also considered as barrier to e-Government IS interoperability. Public awareness, training, and social influence statement have to be carried out in order to achieve e-Government IS interoperability (Khanh, Trong & Gim, 2014).

3.2. Success Factors for e-Government Interoperability

IS interoperability of e-Government through various levels such as technical, semantic, and organizational can be reached via collaboration within government organization (Hwang, Shen, & Chu, 2004; Lallana, 2008). Some of the factors that can enhance IS inoperability of e-Government are listed below.

- **High level e-Government interoperability goals:** Sharing business process in order to reach similar services could be done through collaboration between governmental entities and this come from high level common goals related to e-Government interoperability.
- **Commitment of government bodies:** Common government vision leads to smooth transition to e-Government IS interoperability. Focus on shared vision enables commitment across government entities and enhance the quality of government services delivery (Guijarro, 2007).
- **Customer focus:** Customer's needs should be driving force for IS interoperability of e-Government programs. Improvement in service delivery and reformulation of policies can be done by understanding customers' needs and maintaining trusted relationships with customers. Defining and enhancing government services according to users needs is the success path for IS interoperability of e-Government projects (Chadwick & May, 2003).

3.3. ICT Quality and Benefits

- **Effectiveness, Efficiency, and Transparency:** Internally focused operations will facilitate effective, efficient, and transparent public administration activities (Mohamed, 2010). Higher level of effectiveness and efficiency requires high commitment from top management and full support to enhance e-Government Interoperability (Staden, 2011).

- **Return On Investment (ROI) & Cost reduction:** An analysis of cost and benefits must be done periodically to calculate the net benefits from stakeholders. More benefits can be reaped through private-public partnership (PPP) for improving responsiveness, reducing duplication and reducing costs (Kamal, Themistocleous & Morabito, 2009; Sohimi & Abbas, 2011).

Main barriers that affect e-Government IS interoperability are shown in figure 1 below. As has been explained earlier in this paper, there are six important variables that have an influence on the success of IS interoperability in e-Government projects.

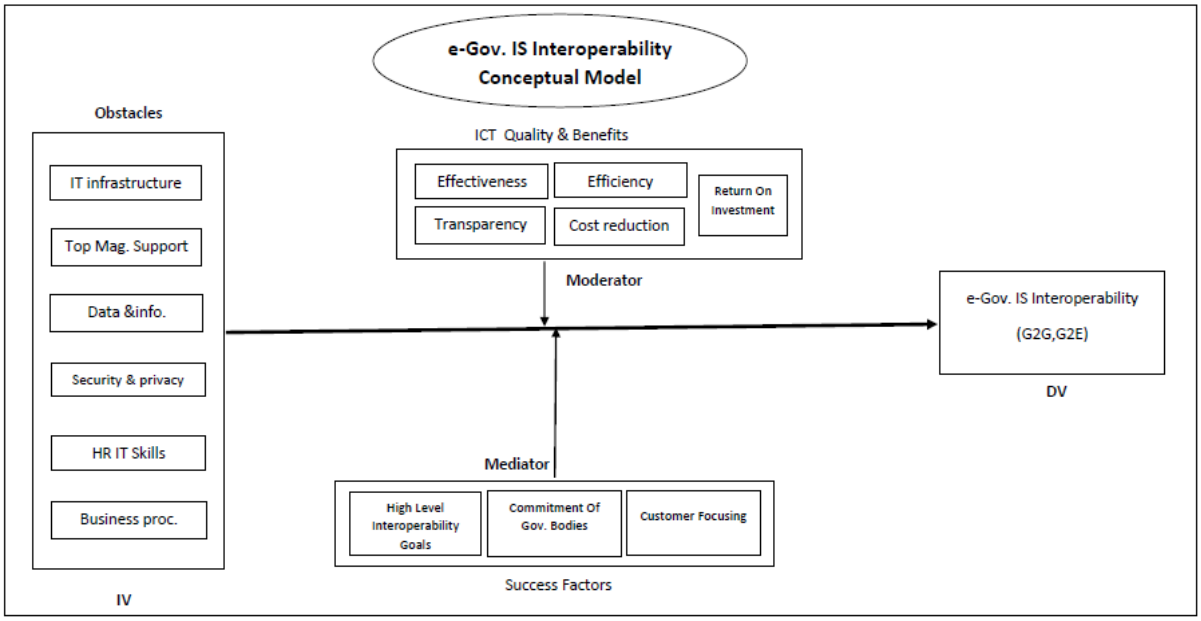

Figure 1. *e-Government IS Interoperability Conceptual Model*

4. E-Government Strategy in Jordan

The e-Government program in Jordan has been carried out under the Ministry of Information and Communication Technology (MOICT) which has implemented the strategy during 2014-2016. The e-Government plan emphasizes on motivating government agencies to deliver services through e-Government by shifting from traditional service delivery to more effective and efficient online service delivery that would serve users (citizens, businesses, government entities and employees) well. This strategy includes national objectives, strategic initiatives and national projects related to e-Government. The e-Government strategic objectives are shown in **figure 2** (Jordan e-Government, 2013).

4.1. E-Government National Objectives

The government in Jordan has chalked out strategy of e-Government for delivering better public services. A set of key objectives has been formulated as given below (Majdalawi, et al., 2015).

- **Improve service delivery:** To speed up the government entities' interaction with stakeholders (G2C, G2B, G2G, G2E) to achieve high service quality.
- **Improve responsiveness:** To provide services and information to public sector by using new accessible channels.
- **Increase transparency:** To focusing on accessibility to services and availability of information to ensure government transparency.
- **Save time and money:** To use common technology standards, policies and financial reforms, which will lead to improved efficiency of service delivery process in public entities.
- **Create positive, spin-off effects:** To develop ICT skills within government agencies and business organizations which will strengthen Jordan's economic competitiveness.

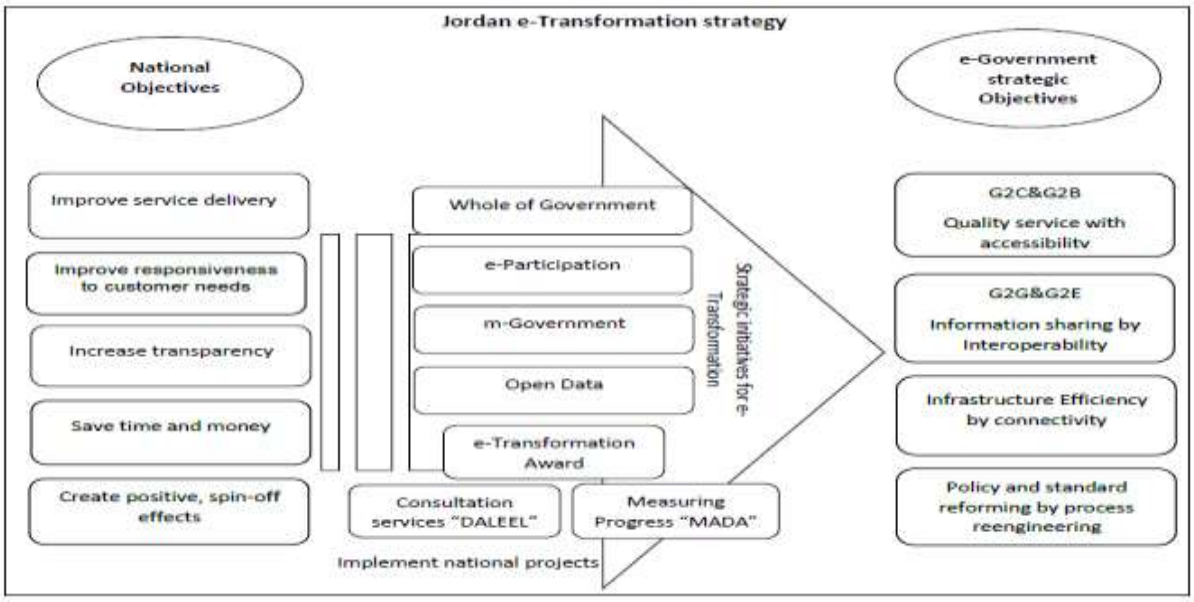

Figure 2. *Jordan e-Government Strategy (2014-2016)*

4.2. Strategic Initiatives

E-Government can contribute to national development if it supported by the right initiatives leading it to reach its main strategic goal (Majdalawi et al., 2015).

- **Whole of Government Approach:** This is an enabler and strategic tool for the public service innovation and productivity growth, which can be achieved through optimal technology utilization.
- **E-Participation:** By creating the environment that empowers involvement of citizens with government activities. This will give a chance for citizens to participate in decision making and enhancing the government services which in turn will increase user satisfaction.
- **M-Government:** By offering services through mobile apps to improve and enhance government services for ease of access by all stakeholders.
- **Open Data:** The government data that can be used and distributed by anyone. Making this data available to public will create a value in different areas including enhancing transparency and encouraging citizens' participation in decision-making.

4.3. National Projects Implementation

E-Government program launched three main projects that would enable government agencies' transition toward e-transformation (Majdalawi et al., 2015).

- **E-Government Award:** This is a competition that awards and rewards excellence in transformation achievements in the area of e-Government and information technology. Purpose is to create e-Government awareness and enhance e-Government knowledge to reach sustainable e-transformation.
- **MADA:** This project measures the progress of e-Transformation in Jordan by assessing the government entities' progress towards e-transformation within Enterprise Architecture Framework.
- **Daleel:** Under this project, consultation services are provided for business development and knowledge creation to enable and speed up government agencies' e-transformation.

4.4. E-Government Strategic Objectives for Evaluation

The government in Jordan is pursuing strategic objectives for evaluating e-Government implementation by applying the key performance indicators (KPIs). This will help in evaluating all public services' transition to e-Government. These KPIs are related to IS interoperability such as information sharing between government

entities, measuring the connectivity within and between entities and reforming the business process reengineering (Jordan e-Government, 2013).

- **G2C & G2B:** The government to citizen and government to business services' interactions will be evaluated by applying the KPIs on the quality of the service, and the ease of accessibility to citizen and business.
- **G2G & G2E:** Government to government and government to employee services' interactions will be measured by evaluating the levels of IS interoperability and the amount of data and information sharing between government entities and within entities themselves. The number of information systems that serve the employees and benefits of these systems will be part of G2E evaluation.
- **Infrastructure efficiency:** Evaluating the standards for connectivity between government entities and within these entities. This evaluation will enhance the organizational level IS interoperability performance.
- **Policy and Standards:** Evaluating the policies and standardization within ICT and business process reengineering to increase the effectiveness and efficiency of e-transformation.

5. Discussion

IS interoperability of e-Government project reaps benefits when interaction between entities through technical, semantic, and organizational interoperability is implemented with standard KPIs focusing on e-service delivery. Strategies and work process need to be aligned while common standards and knowledge should be shared for effective e-Government interoperability. Different governmental entities should describe their current and expected level of e-Government interoperability with clear objectives and initiatives in order to reach their desired state. Government entities must utilize their experience to move towards the national goal of e-Government. In order to get the benefits of e-Government services, IS interoperability must be developed systematically.

From the conceptual model postulated above, the study summarizes the main barriers to e-Government IS interoperability which include ICT infrastructure, top management support, human resources, data and information, business processes, security and privacy. These barriers can be turned to success factors if the e-Government program in Jordan focuses on the national IS interoperability goals from higher management level. The government must ensure the commitment within government entities, focus on citizen participation in decision making and evaluate public the services for their transition to e-Government.

To reach the goals of IS interoperability of e-Government, the Jordanian strategy should work more on performance indicators such as availability of service, flexibility and decrease response time. This will lead to ICT quality benefits such as increased effectiveness and efficiency of public services delivery, which are the main goals of e-Government program in Jordan.

6. Conclusion

In this research, the e-Government IS interoperability with three levels of interaction between government entities and users are analyzed such as technical, semantic, and organizational interoperability. By analyzing cross-agency e-services in Jordan, the study proposes the following.

- E-Government programs face different barriers and challenges based on the level of IS interoperability.
- Interaction and communication between government entities and users depends on the readiness of each entity and top management support.
- The benefits from e-Government IS interoperability vary depending on how the success factors are incorporated into e-Government policy.
- Jordan is one of the developing countries that have started e-Government initiative and e-Government implementation in Jordan will take time to complete.
- The e-Government projects in Jordan are not being implemented as planned in the strategy. This results in delay in reaching e-Transformation in government entities.

The benefits of IS interoperability result from knowledge sharing, aligned strategies and processes, and creation of common values through appropriate interaction at all levels. Investment in e-Government IS interoperability

improves value for government organizations, citizens and businesses. Yet there is difficulty to measure e-Government success using traditional performance measures because value dimension varies across different stakeholders.

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