

The influence of knowledge management practices on e-government success

A proposed framework tested

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Abstract

Purpose – This paper aims to examine the perceived influence of knowledge management (KM) practices on the success of e-government initiatives. This paper proposes a framework depicting the overall perspective of the interactions between the environment and KM practices and associated processes in the context of e-government.

Design/methodology/approach – A conceptual framework was built to set the stage for empirical analysis, which included four major constituents: IT infrastructure, administrative issues, KM practices and e-government projects success. A sample of 181 civil servants completed a survey measuring the factors included in the research model. Structural equation modeling technique was used to test the model.

Findings – Results have identified IT infrastructure and administrative issues as significant predictors of e-government projects' success, where the relationship was mediated by KM practices. The model explained 52.7 per cent of the variance in e-government success.

Research limitations/implications – Governments need to enforce policies to encourage KM practices and make available the needed infrastructure for such environment. The sample size and the new Arabic survey used in the study are the major limitations, where more research is encouraged to validate the instrument and generalize the findings to different environments.

Originality/value – This study is the first in Jordan, and one of the few that related e-government to KM practices by proposing a comprehensive model that sums the factors related to such relationship. Its value stems from its sample of public employees and the support of its proposed framework.

Keywords Knowledge management, Jordan, Structural equation modeling, E-government, Empirical framework, K-Government

Paper type Research paper

1. Introduction

The new applications in e-government contributed to the improvement and effectiveness of services provided to citizens and businesses. Such evolution encouraged countries to deploy such applications and projects and try to advance the level of adoption by citizens

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and public employees. The adoption of e-government projects faces many challenges like the technology needed and infrastructure in the country, the adequacy of legal framework and the behavioral issues facing such projects from citizens' and employees' perspective. It is vital for governments to use such phenomenon regardless of its influence on specific categories of stakeholders.

The requirements of e-government success necessitate the reengineering of some services and the standardization of its implementation (Abu-Shanab, 2015). Based on that, the knowledge acquired by public employees is vital in the process of understanding its implementation success. Such knowledge resides within public employees' cognition since decades. They will resist surrendering such knowledge based on the resulting loss of their power. Research indicated that the risk of sharing knowledge is a challenge for spreading innovations (Dulambazar and Jeung, 2008; Saleh and Abu-Shanab, 2010). Such dilemma requires a conscious effort to encourage public servants to buy into such initiative (i.e. e-government) and share their knowledge related to their work and expertise. Such argument closely relates knowledge management (KM) and e-government success.

Governmental institutions have rigid structures, and slow in responding to change. Such environment makes the adoption of innovation slow and more difficult. It is necessary, when digitizing processes, to fully understand the details of public service and automate these services to offer them online. Such process requires that public employees share their knowledge and experience. KM practices and systems are necessary for the success of this process and the success of e-government projects. Based on our introduction regarding the infrastructure needed for such initiative, the KM practices in public institutions will open opportunities for the success of e-government.

Research in the area of e-government, where public employees are the sample, is not as common as research using citizens as the sample. In addition, research related to e-government interaction with KM is rare. Public sector institutions tried to follow the lead of private sector in benefiting from KM and trying to deploy such concepts in improving their performance. E-government requires a reengineering process (Abu-Shanab, 2015), where operations need to fit with the digital requirements. Previous research focused on sharing knowledge among public employees and institutions (Anand and Walsh, 2016; Henttonen *et al.*, 2016). The two previously described directions require substantial alignment efforts to realize the benefits of both the digital era and KM.

This study is the first to test a model that combines KM within an e-government deployment environment and in a developing country. This study explored the literature related to e-government and KM and tried to understand how the two phenomena interact. The major objective of this work is to propose a model that sums all the factors related to the success of e-government projects from a KM perspective. The second objective of this study is to test such model empirically in an introduction to other researchers to validate such environment and improve our understanding of this domain.

Based on that, Section 2 will try to explore the literature related to e-government and KM. Section 3 will present a comprehensive model that sums all the issues and factors related to the topic under investigation. Section 4 presents the research method followed to test the proposed model. Section 5 will present the empirical test and discuss its results. Finally, Section 6 will include our conclusions and proposed future work.

2. Literature review

Many obstacles face the adoption of e-government that range from technical, legal to behavioral type. This limits its adoption and portrays the project to be a partial or total failure. Governments need to bridge all obstacles facing the project and among them the

human adoption. The following sections will introduce e-government concept, KM concept and the literature related to the obstacles among public employees toward sharing their knowledge to promote the e-government process.

2.1 E-government concepts

E-government is defined as the application of information and communication technology (ICT) and the Internet to offer digital services to citizens (World Bank, 2007; Bhatnagar, 2004), improve the existing traditional ones (Heeks, 2008) and empower citizens to a better participation in the democratic process (Yanqing, 2010; Bataineh and Abu-Shanab, 2016). E-government is known for its contribution to public sector's performance and the substantial improvement in service provision (Jahanshahi *et al.*, 2011; Abu-Shanab, 2013).

The most commonly known models related to the parties involved in the transactions conducted through e-government portals are the following:

- transactions between the government and citizens (called G2C);
- transactions between the government and businesses (called G2B); and
- transactions between the different constituents of government (called G2G) and even its employees (G2E).

Such classification is similar to the one adopted by the e-commerce literature (Riad *et al.*, 2010; Al-Naimat *et al.*, 2012). A similar classification is adopted but for the mobile government environment (Mengistu *et al.*, 2009; Deep and Sahoo, 2011).

The e-government concept existed since the 1990s and continued to evolve and expand to include services, democracy, and social development (Abu-Shanab, 2013). The United Nations conducts a survey bi-yearly, which reflects issues, measures and cases in e-government. The latest report indicated that most countries of the world had some type of existence on the Web and published information regarding their services (UNDESA, 2014). Still many countries lag in their progress in the last two stages (transaction and transformation). Such issue requests more research to understand the reasons behind such situation.

E-government success requests significant efforts in reengineering the process of completing a service. Digital services offered by governments are characterized by being standard, short, authorized and decentralized. Kawalek and Wastall (2005) used the SPRINT method in three cases of e-government and concluded that public organizations prefer a less radical change process in their operations. The results of the previous research indicate that public employees would not easily accept the radical changes required by the reengineering process associated with e-government initiatives. The SPRINT methodology was used in e-government projects to understand the process changes needed in this context (SPRINT is Salford Process Reengineering Involving New Technology).

Another aspect of the reported literature is related to the corruption of public employees. Known for its contribution in reducing corruption, Abu-Shanab and his colleagues conducted a confirmatory factor analysis using 390 responses from Jordanian citizens regarding a list of 21 items related to the factors associated with corruption. Their results yielded three major dimensions: public performance efficiency, transparency and citizens' satisfaction with public service (Abu-Shanab *et al.*, 2013). More research asserts that the internet would open doors for eliminating corruption (Lio *et al.*, 2011), and e-government adoption will reduce corruption (Anderson, 2009). Other researchers proposed designing an anti-corruption e-government system (Kim *et al.*, 2009) to reduce corruption and increase transparency.

The success of e-government projects needs to take into consideration the key success focus areas (KSFA) related to e-services. We mapped the previously mentioned UN e-government evolutionary stages with a set of proposed KSFA. Figure 1 depicts our proposition in this regard. Each stage of the evolutionary model requires a new information and knowledge requirement. It is obvious that transparency is a major focus when dealing with public information. Public data and information can be shared with external parties (like citizens and businesses) free of charge and on public portals. Public employees will see different sacrifices and demands in each stage. The more you advance in the model, the more you will face new and stronger challenges. Such perspective is not always respected by public employees, which causes some resistance to e-government projects. The resistance to change needs a strong leadership and support for such projects or they will be doomed by failure.

The measures used by UN report for e-government development revolved around three major pillars: ICT infrastructure, human capital and Web development (UNDESA, 2014). It is important to build an adequate ICT infrastructure, build human capacity and focus on the e-government website (Cegarra-Navarro *et al.*, 2014). The first two factors are essential for the success of e-government projects. The environment surrounding e-government projects needs also careful attention, where ICT infrastructure needs to be aligned with human capacity to use such technology (labeled by the authors as T-Knowledge).

In conclusion, e-government projects are vital national projects that support the development of an open channel for service provision and social development. E-government is the corner stone of reaching citizens and satisfying their service requirements. Such projects require significant changes in the way governments and their employees work, thus facing some resistance from public employees. One of the shapes of resistance can be in the form of resisting knowledge sharing among e-government champions and experts or public employees. The following section will introduce KM and its processes and dimensions.

2.2 Knowledge and its resources

Different types of organizations are facing a surge of transitions and accelerating changes sweeping today's world, on top of informatics and technical evolution. This evolution relies on advanced scientific knowledge and the best use of information flow resulting from the big ICT developments and Internet applications. Because of these transitions, knowledge

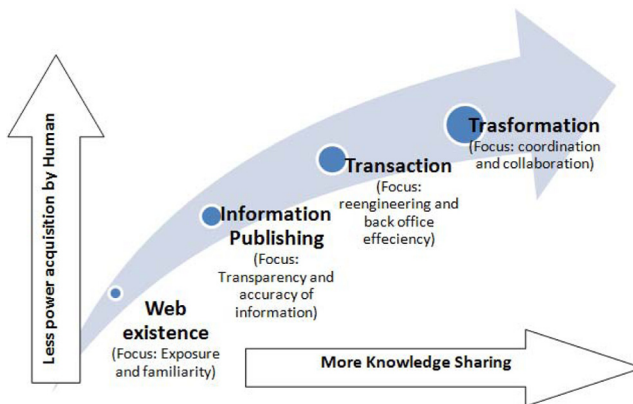


Figure 1.
E-government focus
evolutionary model
(proposed by authors)

has become one of the most significant strategic resources. Moreover, knowledge has become the strongest, most influential and dominating factor in an organization's success or failure (Schwandt and Marquardt, 2000).

According to Probst *et al.* (2001, p. 7), the concept of knowledge includes "the reports and memoranda, the experiences of workers, their skills and the result outcomes from assembled groups and teams integrated". Knowledge, according to this concept, is a mix of tangible objects, such as reports and memos, and other intangibles that lie in individuals' skills and experiences. Perhaps the most important characteristic of this concept is referring to the added value that represents knowledge, which produces a compilation of individuals in groups and integrated teams. More comprehensively, knowledge is defined as "every piece of information, tacit or explicit, that can be recalled by individuals to accomplish their tasks perfectly or make right decisions" (Kubaisi, 2002, p. 48). However, in systems development domain, many other objectives seek achievement through knowledge. The major objectives reported by research are providing advisory services to others and improving the decision-making quality (Khasawneh and Abu-Shanab, 2013).

In the view of certain management theories, the most important aspects of knowledge related to physical and financial assets is when the knowledge becomes strategic and centrally located. Such situation makes organizational success depends on its ability to collect, produce and sustain the continuation of information that represents the anchor of knowledge. Accordingly, the main advantage of knowledge is its ability to assist management to overcome all the difficulties they face and to overcome constraints. In addition, an advantage is its substantial role in the proper functioning of the organization.

Knowledge resources are known to be the objects from where knowledge emerges or where knowledge is contained or gathered. Intelligence, learning and experience define the knowledge limits of individuals (Saffady, 1998). Knowledge resides in books, movies, databases, images, maps, flow charts, novels or even observations of behavior. These resources are of two types: documented and undocumented. Undocumented knowledge is concealed in the minds of individuals. There are several methods to extract knowledge like extensive teamwork, diverse types of communication, e-mails, publishing legal documents or communication through the Internet (Hislop *et al.*, 2000, p. 6).

Knowledge is also classified, according to its humanitarian perspective, into two main types: tacit knowledge and explicit knowledge. Existing literature supported and reported both types (Nonaka and Takeuchi, 1995; Duffy, 2000; Daft, 2006; Heisig and Vorbeck, 2001). Explicit knowledge is the knowledge individuals can share. It includes all the data and information that could be obtained and stored. Examples include stored data and information related to policies, procedures, programs, budgets, and documents related to the system. In addition, all the basis of correction, operation, and communication, and its standards and various functional operations (Hijazi, 2005, p. 66). Tacit knowledge is often stored in the minds of individuals. It is obtained from accumulated past experiences; in most cases, it will have a personal impression, which makes it difficult to acquire, as it is stored inside the mind of the knowledge owner.

The field of KM is relatively new, particularly at the application level. The need to manage knowledge emerged because of the increasing growth and necessity to diagnose the flexibility of organizational structures, which could not cope with rapid change in the market (Soo *et al.*, 2002; Shehabat, 2017). The increasing use of ICT led to the evolution of available information, which is one of the reasons that stimulated the emergence of KM. The main challenge is to search through the information/experiences available and find the most useful for a particular purpose.

2.3 Knowledge management and e-government

Managing knowledge in public sector is considered a challenging task because governmental departments actually create, capture, organize and manage huge knowledge resources. The pressures related to the effective implementation of KM practices on government are related to the following factors: The way government manages and uses knowledge resources, how the effective use of knowledge assets may affect decentralization, policy development, service delivery and other good governance practices.

While little literature is reported in relation to public sector and even less to e-government, most literature on KM addressed the issues, challenges and opportunities for the private sector. Literature related to private sector indicated that KM practices (acquisition, sharing, creation, codification and retention) would result in employees' satisfaction (Kianto *et al.*, 2016). Another study reported the reasons for sharing knowledge to be the enjoyment of helping others, management support and monetary rewards (Razmerita *et al.*, 2016).

Governments often follow the lead of private sector institutions. Historically, research indicated that most of management philosophies were first implemented in large companies of the private sector; once proven to be successful in the field, they were adopted in other sectors. Total quality management, business process reengineering and enterprise resource planning are good examples. Now it is the right time for KM. Governments are now realizing the importance of KM to their service delivery to the public and for the purpose of policy and decision-making, and some of their departments are giving high priority to KM (Metaxiotis, 2009).

Institutions (including public ones) are considered "intelligent organizations" where human actors are involved in the process of information gathering, storing and analyzing to produce information output for further use. It is important to ask the question: "How does public administration know what it knows?" it becomes clear that even though there is indeed a lot of knowledge in organizations, it is not necessarily available anywhere, anytime and for anybody.

As an emerging practice, e-government aims at realizing the processes and structures for using the capabilities of ICTs at different levels of public sector and for enhancing good governance. The key issues in this transformation are based on adopting and going toward interoperable standards, developing appropriate business models and creating legal and policy frameworks that will encourage integration and governance arrangements that support both departmental responsibilities and cross-enterprise approaches and responsibilities.

Like any other organization, public sector organizations have their political process, where public employees try to acquire power through diverse practices. Knowledge would represent a power resource, where employees will resist any initiative that would risk such power. They perceive that knowledge residing within employees or public sector experts is an asset that gives them the needed power to retain their jobs. Entrenching KM practices will facilitate the reengineering process of service provision and make the success of e-government projects more perceptible.

Knowledge sharing is encouraged based on reported classical literature on culture, religion and science. A review of literature and interviews with experts concluded that knowledge sharing generosity will improve firms' performance (Anand and Walsh, 2016). The relationship between public employees' performance and KM is supported by previous research. Henttonen *et al.* (2016) conducted a study on 595 employees and concluded that knowledge sharing will influence performance. The practical implication of their research that relates to this study is the importance of overcoming the challenges facing knowledge

sharing. The second factor is the importance of human element in the public sector, where they are an essential source of knowledge.

Regardless of our perspective adopted in this research, service provision in e-government domain is characterized by being volatile and requires governments to readjust frequently (Heck and Rogger, 2004). The authors assert that such situation cannot be accommodated except if KM systems are adopted. Zhou and Gao (2007) tried to focus on KM and its relationship to e-government environment. They based their work on a three subsystems model: knowledge collection, knowledge organization and knowledge application. Their conceptual propositions regarding the Chinese environment indicated that the success of e-government projects would depend on the ability of their KM practices. Another research analyzed the e-government environment and proposed an ontology that would avoid the ambiguity of terms and definitions. The authors emphasized the role of knowledge unit in e-government [or smart government environment (Fraser *et al.*, 2003)].

Salleh *et al.* (2009) explored the factors related to how KM can contribute to e-government in Malaysia. They classified them into two major categories: human related and technical infrastructure related. The first included face-to-face meetings and paper documentation. The second dimension included intranet, internet access and groupware facilities. The authors also concluded that KM strategy would help Malaysia realize the benefits of k-economy. Their results asserted the role of communication methods and people's knowledge.

Cozzani (2015) reported a case of a KM system presented to the European Commission (EC) to improve the quality and performance of EC employees. The system included the key issues related and were reached through a Delphi technique. The system was proposed to the EC, but not used and tested (as reported by the work). Focusing on public sector practices in relation to KM, a study in Iran explored 20 public sector departments' portals and their related practices to KM (Behzadi *et al.*, 2012). Their results indicated that knowledge creation was the highest followed by knowledge transfer.

In an attempt to explore the factors influencing the knowledge sharing process within e-government, an empirical study used a questionnaire sent to employees in five South Korean agencies (Kim and Lee, 2004). The study considered the following major dimensions (with their sub-dimensions): Culture (visions and goals, trust and social networks), structure (centralization, formalization and performance-based reward system) and information technology (infrastructure and application and end-user focus). The results indicated the significance of social networks, performance-based reward system, infrastructure and application and years of work. Our proposition in this study can distill its premise from the relationship of trust and social network in the cultural context. Trust is an important factor in e-government domain, but previous research focused on citizens' trust in government and technology (Abu-Shanab, 2014). In addition, the reward system emphasizes the role of motivation and power emphasis. The results of the empirical system emphasized the influence of reward system, social network, years of work and infrastructure of KM.

Extending the previously mentioned issues influencing the knowledge sharing capabilities in e-government context, employees need more support and a well-structured plan for learning and awareness. In a study that used responses from 1,100 public employees in the USA, the researchers concluded that leadership efforts are needed to support employee's learning and innovation and ensure that the organizational functional capabilities are well evaluated continuously (Ryan *et al.*, 2012). The authors also concluded that ICT is important for leadership to facilitate KM processes in an e-government context.

The previous studies focused on two major directions: first, the importance of KM practices for the success of e-government. The second issue is the importance of human

factors in the success of KM practices and specifically knowledge sharing (human factors like training, leadership, reward system, awareness, culture, etc.) Based on this, the relationship between KM practices and human factors is not empirically tested and need to be understood better in an e-government context.

Designing and implementing a KM framework for the application in e-government is an important and challenging task. It requires a huge coordination effort from many agencies, departments, and policy makers. In addition to preparing the needed technology, governments must pay attention to the supporting soft infrastructure (i.e. the laws, rules and regulations that must be changed) to facilitate the development of both the new infrastructure and information and knowledge services. While some research investigated the possible application of KM in the public sector, few have focused on the application of KM in e-government.

3. A proposed framework

This study aimed at proposing a model that depicts the interactions in the area of e-government when utilizing KM processes and practices. The focal point of this framework model is to show the vital role of information technology in managing public knowledge resources. The major objective of this process is to help both the knowledge developers and the stakeholders in improving the quality of e-government services and create a public value that leads to the success of e-government (Roy, 2007). The following framework shown in Figure 2 is our proposition for such process. it sums the major directions that will improve e-government offerings based on KM capacity and the diverse stakeholders' roles in the process.

The needed environment that would support KM practices and expedite the success of e-government projects can be categorized into two major areas: ICT and administrative infrastructures. Both e-government and KM systems depend on technical and administrative infrastructure. Technical infrastructure is the collective architecture of hardware and software needed to run such systems. The types of systems needed for the success of both e-government and KM are part/all of the following: Transaction processing systems (TPS), management information systems (MIS), group decision support systems (GDSS), e-mail and video conferencing tools, databases and data warehouses, search tools, knowledge portals and content management systems. The other side of the coin, is the administrative infrastructure, where policies and regulations, processes and code of practice

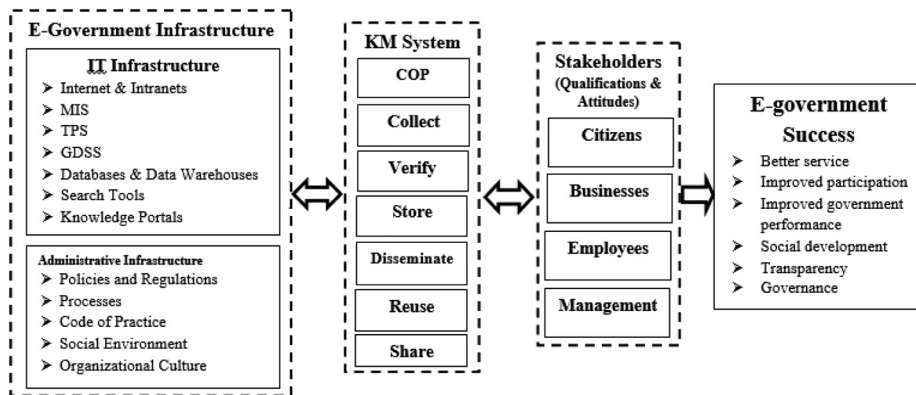


Figure 2.
K-government
Framework
(proposed by authors)

are the major components need for the success of both KM and e-government initiatives. Social systems and organizational culture are factors that cannot be neglected.

It is vital for governments to use the practices of KM to succeed in offering their services effectively. We need to realize (as mentioned previously) that e-government success depends on many dimensions other than service. One of these dimensions is improving government performance (supported by previous studies like [Kianto et al., 2016](#); [Razmerita et al., 2016](#); [Henttonen et al., 2016](#)). KM practices enrich such success and improve public performance based on the following set of practices: establishing and encouraging communities of practice, collecting, verifying, storing, disseminating, reusing and sharing knowledge. Such set of practices will transform governments into knowledge governments (K-government). The best utilization of ICT and the Internet to entrench KM practices will not discard the concept of “e” government, but strengthen it with “k” government image.

The previous process (KM practices vs infrastructure) will not be enabled without the adoption and literacy of the four major stakeholders in this environment: citizens, businesses, employees and management. The four categories are equally important in the success of e-government. The human factor can be a mediator of the process, where any implementation of KM practices and the existence of the needed technical and administrative infrastructure will not lead to a successful e-government unless human believe in it. Based on that the ultimate goal of the proposed framework is the success of e-government. Such success is crowned by more than one direction. The following are the major ones: better service, improved participation, improved government performance, social development, transparency and good governance.

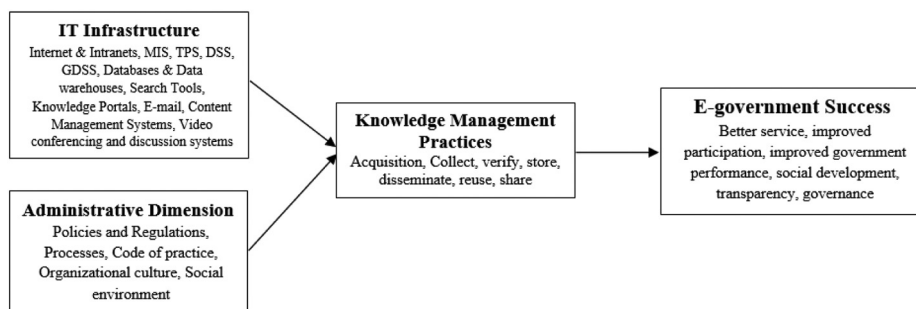
The previous framework is a comprehensive depiction of the reality of utilizing KM practices in e-government domain. The notion of k-government is becoming a reality as public institutions are transforming into knowledge entities. The future will carry more than e-government, it will portray a k-government revolution, where all stakeholders are partners in the best offerings of public sector.

4. Research method

The premise of this study is to test the relationships in [Figure 2](#) and try to add to the body of knowledge an empirical study that can present a realistic image of KM practices and their influence on e-government. The stakeholders mentioned by the framework ([Figure 2](#)) are diverse and could not be explored in one empirical test. Citizens and businesses are e-government project customers, thus might be investigated with a different instrument. We decided in this research to start with public employees’ perspective. The sampling process will target both employees and managers in the public sector.

The proposed framework can be a guiding framework for future projects. In addition, researchers are encouraged to test the model or parts of it. For our tentative attempt to understand the environment, we tried to reduce the model to what is shown in [Figure 3](#). The four proposed variables are adopted from our proposition in [Figure 2](#), but neglecting the stakeholders dimension based on our consideration that the perspective of data collected represents two major categories from the four listed in [Figure 2](#). The flow chart of the steps followed in this research paper is shown in [Appendix 1](#).

The four dimensions included in the research model are assumed to reflect the process of successful e-government implementation based on KM practices. The success of e-government projects depends on many factors like infrastructure, public employees, citizens and governments ([Bataneh and Abu-Shanab, 2016](#); [Tarhini et al., 2015](#); [Garcia-Sánchez et al., 2012](#)). This study will focus on the influence of KM practices on the success of e-government projects. To test such model, an empirical research

Figure 3.
Research model

method is followed using a survey to probe public employees' opinions regarding the context of this research. Further elaboration on the instrument used and sampling process is presented in the following sections. Based on such argument we assume the following hypotheses:

- H1.* IT infrastructure has a significant positive influence of KM practices.
- H2.* Administrative dimension has a significant positive influence of KM practices.
- H3.* KM practices have significant positive influence on E-government success.

4.1 Instrument used

This study designed a survey that measured the items related to the four variables shown in [Figure 3](#). Each factor was measured using one item. The statements developed were all new and included the shortest direct possible statement that would not confuse the respondent. The survey was exposed to three faculty members for content validity, where all three surveys were returned with minor comments. The language of the survey was in Arabic to guard for English language deficiency of public employees. An Arabic language survey is recommended by [Abu-Shanab and Md Nor \(2013\)](#) to better capture the perceptions of respondents and better understand the environment of research. The instrument included three sections: the first introduced the research context and its objectives. The second section included simple demographic questions to better know the sample and its distribution. Finally, the third section included the items shown in the research model ([Figure 3](#)).

The respondents needed to evaluate the statements based on the following description and scale:

- For IT infrastructure, each statement is related to how the application/system contributes to KM effectiveness (scale from 1-10, with 10 being more effective).
- For administrative dimension, the scale evaluated how such administrative dimensions contribute to the success of KM in their department/ministry (scale from 1-10, with 10 being more influential).
- For KM practices: The item measure how far the diverse KM practices are applied in the department (scale from 1-7, with 7 being higher).
- For E-government success: The item measured the success factors of e-government (scale from 1-7, with 7 being higher).

Based on that, and to conclude with our analysis, we adopted a summated variables where each dimension is the sum of all items related: IT infrastructure (nine items), administrative dimension (five items), KM practices (nine items) and E-government success (eight items).

4.2 Sample and sampling process

The total sample collected by the research team concluded to 181 usable surveys. The research team visited 23 public departments and voluntarily requested employees and managers to fill the survey (Appendix 2 includes the list of public departments where employees filled the survey). The demographics of the sample collected are shown in Table I.

The recommended sample size for a structural model test is five surveys for each item used or 10-20 surveys for each variable (Hair et al., 1998). The total recommended sample size is 155 surveys according to the total number of items used in the survey (31 × 5 = 155 surveys), and 80 surveys according to the variable size (20 × 4 = 80 surveys). The total surveys used for analysis exceeds the recommended threshold, which is the maximum of the previous two limits (181 > 155). The research team started the collection of data in early December 2016, and finished the survey collection by the end of January 2017. It is important to keep the process voluntary and probe bias free responses, which might be challenging when we consider the topic of research.

| Category | Frequency | (%) |
|---------------------|-----------|------|
| <i>Gender</i> | | |
| Male | 76 | 42 |
| Female | 104 | 57.5 |
| Not reported | 1 | 0.5 |
| Total | 181 | 100 |
| <i>Occupation</i> | | |
| Manager | 10 | 5.5 |
| HOD | 27 | 14.9 |
| Employee | 134 | 74 |
| Other | 10 | 5.5 |
| Total | 181 | 100 |
| <i>Age</i> | | |
| 20-35 years | 77 | 42.5 |
| 36-50 years | 81 | 44.8 |
| More than 50 years | 23 | 12.7 |
| Total | 181 | 100 |
| <i>Experience</i> | | |
| Less than 5 years | 44 | 24.3 |
| 5-15 years | 77 | 42.5 |
| More than 15 years | 60 | 33.2 |
| Total | 181 | 100 |
| <i>Education</i> | | |
| Tawjehi and Diploma | 50 | 27.6 |
| Bachelor | 93 | 51.4 |
| Master | 29 | 16 |
| PhD | 9 | 5 |
| Total | 181 | 100 |

Table I.
Demographics of
sample

5. Data analysis and results

The research model shown in [Figure 3](#) needs to be analyzed using path analysis. The more robust methodology that takes into account the full mediation effect and all paths of influence is structural equation modeling (SEM). The tool used for such purpose is SmartPLS ([Ringle and Sven Will, 2005](#)). A partial least squares (PLS) method using SEM overcomes the normality of variables constraint as it relies on a non-parametric bootstrap procedure to test the model. The method draws many smaller subsamples and re-tests the model many times. The tool generates needed results and tests of parameters.

The items used in the survey tried to comprehensively cover major IT infrastructure (applications used or needed). Also, the administrative factors related to such practices and the KM practices known in the literature. Finally, we adopted the perspective of most e-government textbooks in relation to e-government success. The mean of all items and the grand mean of each dimension are all calculated and all results are posted in [Appendix 3](#) with a short description of each item. The scale classification is shown in [Table II](#).

Results indicated moderate perceptions for all four dimensions, where all of them were closely related. As for the individual items, the highest item among all IT infrastructure items was the availability of the internet and intranet, and the lowest was for the use of GDSS. The highest item among the ones used to measure the administrative factors was related to the regulations and policies, and the lowest was for the employee's code of conduct. As for the KM practices, the highest was related to storing knowledge and the lowest is related to KM. Finally, the success of e-government was highly associated to service provision, and the lowest item was citizens' participation.

The second estimated set of parameter are the internal reliability measures using Cronbach's alpha. Where all four variables depicted a recommended value (more than 0.8 as recommended by [Hair et al., 1998](#)). [Table III](#) represents the set of Cronbach's alpha values.

The inclusion of each item in the study in measuring the dimension allocated to it can be explained based on conceptual meaning of each item and the content validity of such item. The solid conceptual review of the study and the experience of researchers are major factors for such allocation. Still, the empirical methodology used can support the allocation and test for such allocation. A confirmatory factor analysis is conducted using the same application (SmartPLS) and generating a rotated factor loadings matrix. The initial matrix is shown on the left of [Table IV](#) and the cleaned matrix is shown on the right of the same table. All cross

| Scale | Low perceptions | Moderate perceptions | High perceptions |
|-----------|-----------------|----------------------|------------------|
| 10 points | 1-4 | 5-7 | 8-10 |
| 7 points | 1-3 | 4-5 | 6-7 |

Table II.
Scale classification
of survey

| Variable | N | Items used | Cronbach's alpha |
|-------------------------------|-----|------------|------------------|
| Administrative Dimension (AD) | 181 | 5 | 0.9161 |
| IT Infrastructure (IT-IS) | 181 | 9 | 0.9502 |
| KM (KM) | 181 | 9 | 0.9473 |
| E-Gov. Success (EGOVs) | 181 | 8 | 0.9382 |

Table III.
Cronbach's alpha
values

| Item | Cross Loadings | | | | Outer Loadings | | | |
|------|----------------|---------------|---------------|---------------|----------------|--------|--------|--------|
| | AD | EGOVs | IS | KM | AD | EGOVs | IS | KM |
| AD1 | <i>0.857</i> | 0.5158 | 0.5199 | 0.4602 | AD1 | 0.857 | | |
| AD2 | <i>0.9147</i> | 0.5826 | 0.5049 | 0.5236 | AD2 | 0.9147 | | |
| AD3 | <i>0.8309</i> | 0.4874 | 0.4913 | 0.3793 | AD3 | 0.8309 | | |
| AD4 | <i>0.8936</i> | 0.546 | 0.4663 | 0.4939 | AD4 | 0.8936 | | |
| AD5 | <i>0.8282</i> | 0.4822 | 0.4893 | 0.4355 | AD5 | 0.8282 | | |
| EGS1 | 0.523 | <i>0.8013</i> | 0.508 | 0.6806 | EGS1 | | 0.8013 | |
| EGS2 | 0.5096 | <i>0.8157</i> | 0.497 | 0.6027 | EGS2 | | 0.8157 | |
| EGS3 | 0.4386 | <i>0.8102</i> | 0.269 | 0.5515 | EGS3 | | 0.8102 | |
| EGS4 | 0.5581 | <i>0.8301</i> | 0.3846 | 0.599 | EGS4 | | 0.8301 | |
| EGS5 | 0.5445 | <i>0.8491</i> | 0.2903 | 0.5984 | EGS5 | | 0.8491 | |
| EGS6 | 0.4867 | <i>0.8578</i> | 0.3266 | 0.6014 | EGS6 | | 0.8578 | |
| EGS7 | 0.534 | <i>0.8641</i> | 0.316 | 0.6157 | EGS7 | | 0.8641 | |
| EGS8 | 0.4462 | <i>0.8543</i> | 0.3544 | 0.5836 | EGS8 | | 0.8543 | |
| IS1 | 0.4056 | 0.358 | <i>0.7276</i> | 0.3808 | IS1 | | 0.7276 | |
| IS10 | 0.3279 | 0.2009 | <i>0.7406</i> | 0.3487 | IS10 | | 0.7406 | |
| IS11 | 0.4318 | 0.3812 | <i>0.8202</i> | 0.3968 | IS11 | | 0.8202 | |
| IS12 | 0.468 | 0.3645 | <i>0.7986</i> | 0.3372 | IS12 | | 0.7986 | |
| IS2 | 0.5109 | 0.4419 | <i>0.834</i> | 0.417 | IS2 | | 0.834 | |
| IS3 | 0.4639 | 0.3528 | <i>0.8128</i> | 0.3679 | IS3 | | 0.8128 | |
| IS4 | 0.4338 | 0.4164 | <i>0.8014</i> | 0.3667 | IS4 | | 0.8014 | |
| IS5 | 0.5317 | 0.4465 | <i>0.801</i> | 0.3478 | IS5 | | 0.801 | |
| IS6 | 0.4981 | 0.3339 | <i>0.842</i> | 0.3859 | IS6 | | 0.842 | |
| IS7 | 0.5023 | 0.3827 | <i>0.7907</i> | 0.4178 | IS7 | | 0.7907 | |
| IS8 | 0.4473 | 0.2315 | <i>0.8287</i> | 0.3152 | IS8 | | 0.8287 | |
| IS9 | 0.4572 | 0.3459 | <i>0.8475</i> | 0.3614 | IS9 | | 0.8475 | |
| KM1 | 0.4958 | <i>0.6437</i> | 0.48 | <i>0.8446</i> | KM1 | | | 0.8446 |
| KM2 | 0.4809 | 0.5851 | 0.4454 | <i>0.8364</i> | KM2 | | | 0.8364 |
| KM3 | 0.3649 | 0.5516 | 0.3039 | <i>0.8194</i> | KM3 | | | 0.8194 |
| KM4 | 0.4131 | 0.5836 | 0.4142 | <i>0.8511</i> | KM4 | | | 0.8511 |
| KM5 | 0.4844 | <i>0.6261</i> | 0.3739 | <i>0.8197</i> | KM5 | | | 0.8197 |
| KM6 | 0.4587 | <i>0.6121</i> | 0.4056 | <i>0.8733</i> | KM6 | | | 0.8733 |
| KM7 | 0.453 | <i>0.6276</i> | 0.3963 | <i>0.8675</i> | KM7 | | | 0.8675 |
| KM8 | 0.4067 | 0.5946 | 0.3089 | <i>0.8316</i> | KM8 | | | 0.8316 |
| KM9 | 0.4548 | <i>0.6411</i> | 0.348 | <i>0.8038</i> | KM9 | | | 0.8038 |

Table IV.
Factor loadings matrix

Note: Numbers in italic represent loadings at acceptable levels (> 0.6)

loadings above 0.6 can be problematic except if the loading on the original dimension is high (>0.8).

It is also important to test for multicollinearity and if the choice of the variables is accurate and appropriate. To do such test, a correlations matrix is estimated where values of 0.9 and above between the independent variables indicate a multicollinearity issue (Hair *et al.*, 1998). The second issue is the low (or insignificant) bivariate correlations between each independent variable and the dependent variable. Such classification of dependent vs independent is not accurate in a mediated model, where dependent variables might be independent for others (mediators). Both conditions are satisfied, where no extremely high correlations exist (the highest value is 0.726) and all correlations were significant (lowest was 0.445). Table V depicts the correlation matrix generated by SmartPLS.

To test the research model, two major diagrams are generated. The first is the model with all loadings, and the betas associated with the relationships and the coefficient of

determination. The second diagram estimates the *t*-values associated with the beta tests using the previously mentioned bootstrapping technique. Figure 4 shows the structural model and the loadings of each item on the corresponding dimension. Figure 5 shows the *t*-values associated with each relationship.

The results of the estimated model indicate a full support of our proposed research model. The beta values all exceeded the threshold limit (with *t*-values > 1.96, indicating a significance level less than 0.05). The coefficient of determination of e-government success reached 0.527, which means an explanation of variance = 52.7 per cent. Such level is considered moderate and substantial. Similarly, the coefficient of determination for the KM practices is equal to 0.323 (which means an explanation of 32.3 per cent of the variance in KM practices in the public sector).

This study proposed a framework that comprehensively describes the environment related to KM practices and its influence on e-government success. The context of the tested model utilized employees and managers only (leaving citizens and business for future research). The two tested human dimensions were combined in the analysis to utilize the overall perspective. Such merge of sample might be criticized based on the differences in perspective between managers and employees. To test for such differences (if they exist), we

| Variable | AD | EGOVs | IT-IS | KM |
|-------------------------------|---------|---------|---------|----|
| Administrative dimension (AD) | 1 | | | |
| E-Gov. Success (EGOVs) | 0.606** | 1 | | |
| IT Infrastructure (IT-IS) | 0.569** | 0.445** | 1 | |
| KM | 0.534** | 0.726** | 0.464** | 1 |

Table V.
The Correlations matrix

Note: **Correlations are significant at the 0.01 level ($p < 0.01$)

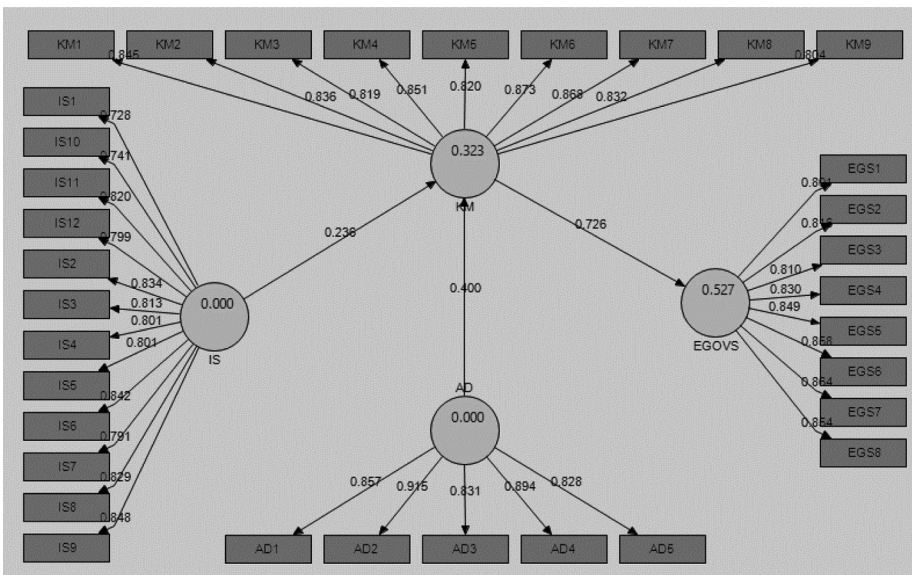


Figure 4.
The estimated structural model (using SmartPLS)

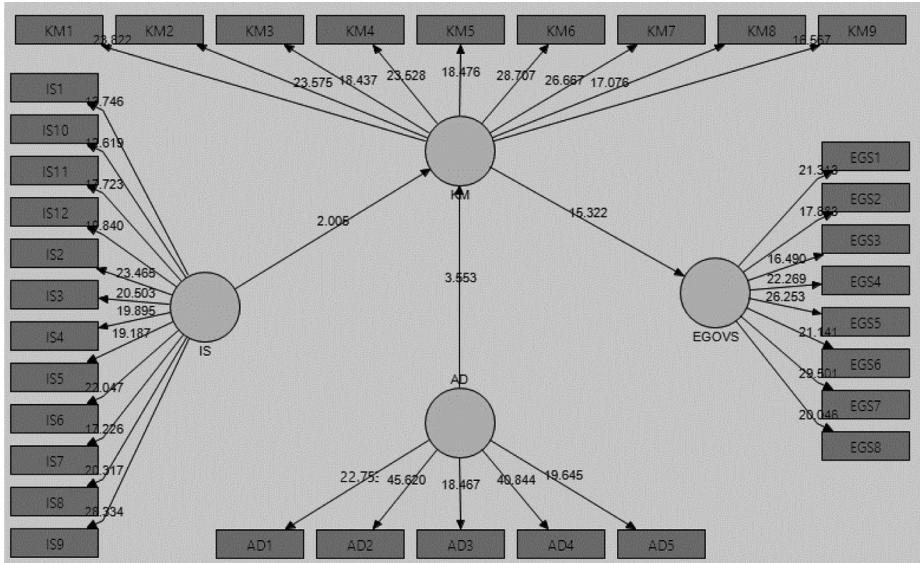


Figure 5.
The estimated *t*-values using a bootstrapping technique (using SmartPLS)

conducted a one way analysis of variance test (ANOVA), and using all occupation categories. Results indicated no significant differences between all categories and based on the four major constructs of the study. Table VI shows the results of the test.

6. Conclusions and future work

This study started with an ambitious model that comprehensively describes KM environment and its contribution toward a successful e-government implementation. The model started from the basics of ICT success, where ICT infrastructure is the base for conducting business in the twenty-first century. The second issue that interacts and limits/reinforces the full utilization of ICT is the administrative, legal and environmental issues. Both directions are vital for effective and efficient KM practices,

| Variables | Sum of squares* | df | Mean square | F | Sig. |
|-------------------------------|-----------------|-----|-------------|-------|-------|
| E-Gov. Success (EGOVS) | 0.413 | 3 | 0.138 | 0.067 | 0.978 |
| | 366.285 | 177 | 2.069 | | |
| | 366.698 | 180 | | | |
| IT Infrastructure (IT-IS) | 5.674 | 3 | 1.891 | 0.406 | 0.749 |
| | 824.226 | 177 | 4.657 | | |
| | 829.899 | 180 | | | |
| Administrative dimension (AD) | 12.401 | 3 | 4.134 | 0.858 | 0.464 |
| | 853.126 | 177 | 4.820 | | |
| | 865.528 | 180 | | | |
| KM | 2.342 | 3 | 0.781 | 0.398 | 0.755 |
| | 347.259 | 177 | 1.962 | | |
| | 349.600 | 180 | | | |

Table VI.
ANOVA Test based on occupation of sample

Note: *Numbers are for sum of squares: between groups, within groups and total, respectively

where employees are encouraged to acquire, share, disseminate and reuse knowledge within the organization. The sustainability of organizations is associated with storing and reusing knowledge when needed. The intellectual capital embedded in organizations is one of the important factors in competing in the market and sustaining such competitive advantage.

The existence of a sustained and encouraged KM environment will lead to successful e-government projects and a strong relationship between governments and diverse categories of stakeholders. The model proposed tried to depict such process by assuming that the availability and adequacy of IT infrastructure and the administrative environment (with its different sub-factors) will lead to the success of e-government. Such relationship is mediated by KM practices.

To test such conceptual model, an attempt to collect data from public employees using a survey designed for such purpose. Studies in this area are rare, and none has been done in Jordan (up to the knowledge of the authors). Such important contribution supports and encourages future research to investigate the assumed relationships and further test other factors associated with it. The sample used included 181 surveys collected from 23 public departments/ministries.

The analysis revealed a full support to our argument and supported both the influence of IT infrastructure and administrative dimensions on KM practices. The perspective on the administrative/technical challenges facing governments when implementing KM practices was supported in this paper (in alignment with [Henttonen et al., 2016](#); [Dulambazar and Jeung, 2008](#)). Also, the same structural model supported the influence of KM on e-government success. This study used SEM as a technique to better use the sample size, where multiple relationships are estimated at the same time. The results yielded an explanation of variance equal to 52.7 per cent of e-government success. The model is a guiding path to practitioners and researchers for future attempts to understand such environment. [Table VII](#) shows the hypotheses testing results.

6.1 Implications for research and practice

Governments are challenged by the mentality and attitude of public employees. They need to encourage KM practices and make available the needed infrastructure for such environment. Public employees will resist this change based on their interest in the process and the nature of change itself. They need to put in place policies that inspire public employees toward an effective KM practices that will lead to a successful e-government initiatives. The moderate perceptions of employees indicate the importance of all dimensions and the serious effort needed to improve infrastructure, pay attention to administrative issues and KM practices in the organization.

The item analysis also indicated that employees consider the Internet (and local intranet) are vital resource for the success of such environment. The reason behind such argument is

| Relationship | Beta | <i>t</i> | Sig | Hypothesis result |
|----------------------------------------------|-------|----------|---------|-------------------|
| Administrative dimension (AD) → KM practices | 0.400 | 3.553 | < 0.01 | Supported |
| IT infrastructure (IT-IS) → KM practices | 0.236 | 2.005 | < 0.05 | Supported |
| KM practices → E-Gov. Success (EGOVs) | 0.726 | 15.322 | < 0.001 | Supported |

Note: Results shown in table are extracted from [Figures 4](#) and [5](#)

Table VII.
Model testing results

the local view of most systems except for the Internet, where it became an essential aspect of conducting business. The stress on infrastructure as a whole is also emphasized, where such result is aligned with previous research (Islam and Avdic, 2010). It is not the physical infrastructure only (hardware), but the systems infrastructure, where Dulambazar and Jeung (2008) emphasized the need for other systems that aid in the success of KM practices in public sector (examples like CRM, data analytics and community apps).

On the other hand, the use of GDSS is not fully used, where respondents indicated a low perception for this type of systems. The highest factor within the administrative dimension was the one related to policies and regulations. The employees' perceptions are important as they feel that policies are not supporting such environment or at least lagging behind the momentum needed. Such issue raises previous claims of being a fashion or fad. Employees also indicated that code of conduct is not as important as other items, which goes back to waiving responsibility from their account to top management account (based on the lag of policies and regulations). Public departments need to focus on such issue and embrace technology and build a positive and supportive environment for that. More structured and targeted training programs need to be put in place and put a reward system to support such initiative (policy change). Finally, the full support of executive officials is crucial for the success of KM initiative in government (Singh *et al.*, 2012; Islam and Avdic, 2010).

The KM practices adopted in this research are common actions that are reported in the literature. The highest perceived practice was storing knowledge, and the lowest was related to KM in general. Such result might seem surprising, where storing knowledge can be overcome technically (by new techniques of DMS or ES), but depends on extracting such knowledge at the first step. Finally, the success of e-government was perceived as providing services. Such results supports existing research that consider the core activity of e-government to be providing services to citizens and businesses. On the other hand, subjects did not see electronic participation to be a crucial aspect in the process. Which deviate for the results reported in previously mentioned research (Bataineh and Abu-Shanab, 2016).

6.2 Limitations and future research

This research suffered from a small sample size, where the research team put all needed effort to make a case for filling the survey voluntarily and without any formal pressure. Second, the survey is developed by the researchers and is newly used. Future research can attract a large financial fund to explore our proposed conceptual model and increase the sample size. The dispersion of our sample between 23 ministries and departments might be a significant contribution, but might have also fragmented the results. To address the environment of specific ministries better, a more focused sampling process might yield different results.

The sample also included unbalanced categories with respect to occupation, where a valid statistical test is difficult to be defended. Future research might focus on one category at a time. The instrument used can be described as an overall instrument, where detailed items can be added. The case of ICT might not fit with our argument, but when exploring knowledge sharing, the literature is full of studies that utilized instruments with multiple items. Finally, future research is recommended to address citizens and business perspectives, where a restructure of this model is needed. Other factors can be explored to see if they have a relation to this framework. Our contribution is substantial, but a replication of this work will yield interesting results.

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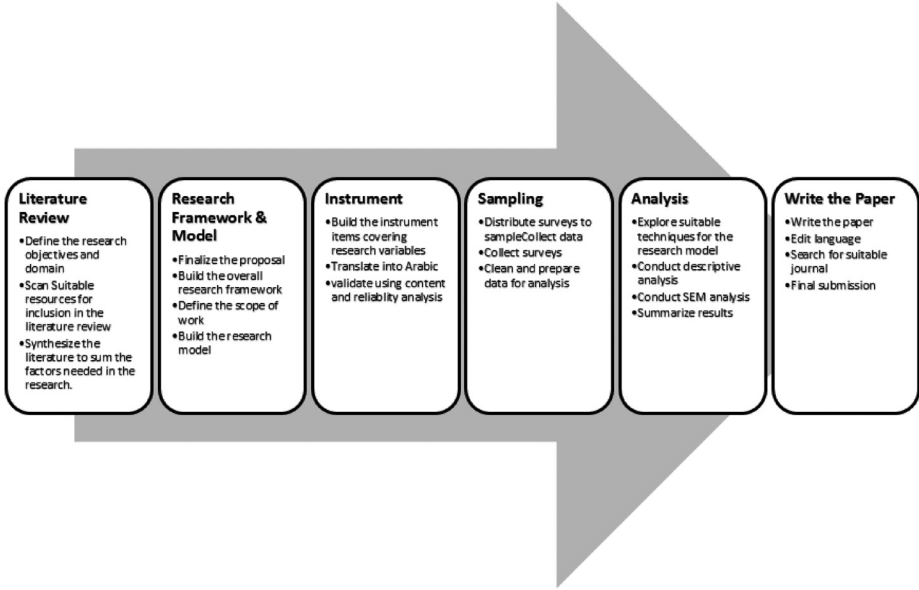


Figure A1.
Research procedure

| # | Department name | No. of surveys | Website |
|----|-----------------------------------------------------------|----------------|-------------------------------------------------------------------|
| 1 | King Abdullah University Hospital (KAUH) | 6 | www.kauh.jo |
| 2 | Ministry of Endowments and Islamic Affairs and Holy Sites | 5 | www.awqaf.gov.jo |
| 3 | Ministry of education | 13 | www.moe.gov.jo |
| 4 | Ministry of Interior | 5 | http://moi.gov.jo |
| | Jordan Post | 11 | https://jordanpost.com.jo |
| 6 | Ministry of municipals affairs | 10 | www.mma.gov.jo |
| 7 | Ministry of Health | 12 | www.moh.gov.jo |
| 8 | Yarmouk University | 7 | www.yu.edu.jo |
| 9 | Civil Status And passport Department | 11 | www.cspd.gov.jo |
| 10 | Arab Bank | 6 | www.arabbank.jo |
| 11 | Jordan University of Science and Technology | 5 | www.just.edu.jo |
| 12 | National Aid Fund | 5 | www.naf.gov.jo |
| 13 | Social Security Corporation | 9 | www.ssc.gov.jo |
| 14 | Jordan Standard and Metrology Organization | 6 | www.jsmo.gov.jo |
| 15 | Balqa Applied University | 5 | www.bau.edu.jo |
| 16 | Al-Albays University | 5 | www.aabu.edu.jo |
| 17 | Greater Irbid Municipality | 10 | www.irbid.gov.jo |
| 18 | Ministry of Social Development | 8 | www.mosd.gov.jo |
| 19 | Jordan University | 6 | www.ju.edu.jo |
| 20 | Irbid District Electricity Company | 10 | www.ideco.com.jo |
| 21 | General Supplies Department | 8 | www.gsd.gov.jo |
| 22 | Ministry of Public Works and Housing | 9 | www.mpwh.gov.jo |
| 23 | Ministry of Finance | 9 | www.mof.gov.jo |
| | Total sample collected | 181 | |

Table AI.
List of the public
departments
contributing to the
sampling process

| Item short description | Mean | SD |
|--------------------------------------------------------|-------|-------|
| IS1: Use of Internet and Intranet | 7.751 | 2.287 |
| IS2: Use of MIS | 6.215 | 2.561 |
| IS3: Use of TPS | 6.105 | 2.624 |
| IS4: Use of decision Support Systems (DSS) | 5.575 | 2.587 |
| IS5: Use of GDSS | 5.448 | 2.741 |
| IS6: Use of Database and data warehousing (DB and DW) | 6.790 | 2.793 |
| IS7: Use of Search tools | 6.851 | 2.645 |
| IS8: Use of Knowledge portals | 6.381 | 2.703 |
| IS9: Use of e-mail | 5.724 | 2.710 |
| IS10: Use of Content management systems (CMS) | 7.309 | 2.602 |
| IS11: Use of Document Management Systems (DMS) | 6.354 | 2.880 |
| IS12: Use of Video conferencing and discussion systems | 5.790 | 2.862 |
| <i>Overall mean for IT infrastructure dimension</i> | 6.358 | |
| AD1: The regulations and policies used | 7.133 | 2.659 |
| AD2: The operations and techniques used in workplace | 7.094 | 2.462 |
| AD3: Job code of conduct | 6.464 | 2.538 |
| AD4: Organizational culture | 6.735 | 2.522 |
| AD5: Social relationships and environment | 6.851 | 2.493 |
| <i>Overall mean for administrative dimension</i> | 6.855 | |
| KM1: knowledge discovery | 4.906 | 1.744 |
| KM2: Knowledge collection | 4.757 | 1.712 |
| KM3: Knowledge refinement and verification | 4.669 | 1.613 |
| KM4: Knowledge acquisition | 4.917 | 1.741 |
| KM5: Knowledge store | 5.155 | 1.673 |
| KM6: Knowledge dissemination and exchange | 5.066 | 1.625 |
| KM7: Knowledge transfer | 4.818 | 1.597 |
| KM8: Knowledge reuse | 4.895 | 1.611 |
| KM9: knowledge management | 4.630 | 1.640 |
| <i>Overall mean for KM practices</i> | 4.868 | |
| EGS1: Improve service provision | 5.122 | 1.712 |
| EGS2: improve citizens participation | 4.552 | 1.655 |
| EGS3: improve financial performance | 4.674 | 1.712 |
| EGS4: improve administrative performance | 4.790 | 1.619 |
| EGS5: contribute to society development | 4.669 | 1.713 |
| EGS6: improve transparency level | 4.586 | 1.810 |
| EGS7: improve accountability | 4.696 | 1.745 |
| EGS8: improve good governance image | 4.602 | 1.695 |
| <i>Overall mean for e-government success</i> | 4.711 | |

Table AII.
Means and standard deviations of survey items

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