

## Advanced Technological Factors of Information Sharing for Government Organizations

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**Abstract:** Electronic Information Sharing (EIS) means sharing the information electronically by using ICT such as internet, email, phone, mobile and websites. Electronic information sharing can help the decision makers to make better and faster decisions and can speed up the delivering of government services. Despite its benefits, EIS causes many challenges in public organizations. One of the biggest challenges in EIS is technological barrier including the challenges occur in sharing information with different formats of data storage and platforms in different organizations. This research proposes advanced technological factors to increase the participation of electronic information sharing in public sector. These advanced technological factors are data warehouse and cloud computing.

**Key words:** Electronic information sharing, technological factors, cloud computing, data warehouse, social media

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### INTRODUCTION

Electronic Information Sharing (EIS) means sharing the information electronically by using ICT such as Internet, email, phone, mobile and websites. According to Akbulut *et al.* (2009) “electronic information sharing can be accomplished directly or indirectly through an information repository. Electronic information sharing can help the decision makers to make better and faster decisions to speed up the delivering the government services and develop the quality (Bigdeli *et al.*, 2011; Jing *et al.*, 2014).

In our current age of high mobility and increasing availability of technology, there is still limited information sharing among government agencies that reduces the likelihood of getting caught when they exchange it (Mohammed *et al.*, 2014).

Electronic information sharing causes many challenges in public organization such as information sharing is based on sharing and accessing information from multi data sources such as several databases, documents, images and text files. Therefore, these multi data sources is one of the electronic information sharing challenges because it provides limited accessibility and availability of information as well as unstructured and unintegrated information (Bigdeli *et al.*, 2011; Pardo and Tayi, 2007; Kamal *et al.*, 2012). Furthermore, information store in different platforms might be available in one place and not available to others (Bhanti *et al.*, 2011). However, the central information systems that use common data storage (such as data warehouse, cloud computing) assist government agencies in increasing information sharing among them (Yang *et al.*, 2014). The

availability, accessibility, standard format and structure of information that the data warehouse and cloud computing provides to user can increase the electronic information. Therefore, data warehouse has been used instead of multi databases to support information sharing (Corradini *et al.*, 2006).

These challenges occur since different kinds of public organizations operate within different levels and backgrounds such as central organization and its sub. Thus, there is a need for collaborations between public organizations to provide better public services to citizens (Bigdeli *et al.*, 2011).

The sharing of information can be done by crossing the barriers that public organization faced (Pardo and Tayi, 2007). Pointing out technical barrier is the main challenge in adopting electronic information sharing project in inter-organizational, therefore, in order to support information sharing project, it is necessary to deploy proper software, hardware and telecommunication technologies (Kamal *et al.*, 2012). There are limited studies about EIS in terms of technical solution to increase the information sharing and most of these studies tried to solve the technical issues by discover the technological factor. Thus, this research suggested to investigate technological factors which can increase and assist the participation of EIS in public sector. Therefore, the question of this research is “what are the technological factors that can increase the participation of electronic information sharing in government sector?”

This study examined three technological factors which were considered as advanced tools to increase information sharing electronically.

**Function of electronic information sharing:** There are two types of functions of electronic information sharing (vertical functioning and horizontal functioning) that refer to interaction and collaboration between information systems of organizations (Bhanti *et al.*, 2011). The horizontal functioning of electronic information sharing means sharing information electronically within the same level of organization. In another words, horizontal electronic information sharing refers to sharing information electronically with organization that has the same criteria, goals, characteristics and so on such as sharing information between local governments electronically. Figure 1 shows the horizontal functioning of electronic information sharing.

The vertical electronic information sharing, on the other hand refers to sharing information electronically with other organizations that has lower or higher criteria, goals characteristics and so on such as electronic information sharing between central government and local government. Figure 2 shows the vertical information sharing.

ICT infrastructure is considered as an important challenge of electronic information sharing (Yang *et al.*, 2014). Moreover, information sharing could be based on sharing and accessing information from multi data sources such as documents, images and text files. Therefore, this diversity of resources would cause many critical problems like different data format and information and incompatible software and hardware. As a consequence to solve these problems, organizations should develop data standards, construct ontology systems and design interoperable applications to provide a structure to across heterogeneous and unstructured resources (Corradini *et al.*, 2006; Lam, 2005; Jing *et al.*, 2014). One of the biggest challenges in information sharing is when different organizations in different locations shared huge amounts of data and information that have different format and store in different platforms. This situation caused many kinds of factors including information quality, security, accuracy, consistency and completeness.

This research focused on determining the significance of two advanced technological factors; data warehouse and cloud computing in increasing the participation of EIS between government organizations which can be applied vertical and horizontal.

**Information sharing in government sector:** In government sector, information is considered as the most important resource (Yan *et al.*, 2009). Governmental information sharing is the ability of government public organizations to obtain, apply and process information in



Fig. 1: Horizontal EIS between organizations

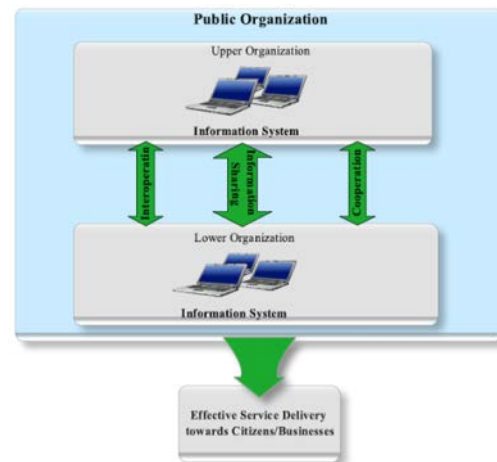


Fig. 2: Vertical EIS between organizations

society with citizens (Estevez *et al.*, 2010). The first definition of information sharing was by Dawes (1996) when she defined it as the exchange of information among employees within and outside an organization or giving them access to information in order to effective decision making. Information sharing provides many benefits such as integrate services, enhance policy making, improve decision making, high product quality, reduce process work, develop the formulation and implement and evaluate the organization's policies (Yan *et al.*, 2009).

Electronic information sharing increases the information amount which can help the decision makers to make better decisions (Akbulut *et al.*, 2009; Bigdeli *et al.*, 2011). Previous research has described three kinds of information sharing; intra-organizational information sharing which describes the information sharing based on the person (individually), inter-organizational information sharing which focuses on sharing information among

two or more organizations and inter-agency/department information sharing which focuses on sharing information within the organization and across its departments. This study can be applied on three of them based on the requirement of government organization, agencies, department or employees. In general, governments in developing countries need to increase the electronic information sharing among its agencies to support the e-Services (Mohammed *et al.*, 2014, 2015). Therefore, they use ICT such as the internet to get the information and knowledge for purpose providing services and also it uses to sharing information by their staffs. For example, according to Alhadithi, Idrus and Elameer (Alhadithi *et al.*, 2011), public universities need to share the information electronically with Ministry of Higher Education in order to increase amount of information, quality of information in each university in order to provide quality of services within short time.

**Technological factors of information sharing:**

Technological factors refers to ability and the capability of technological that can use to share the information electronically (Kamal *et al.*, 2012). Technological factors such as IT compatibility, information quality, data warehouse, cloud computing and social media.

Technical compatibility refers to integrated level of information system and application between organizations (Dawes, 1996). The challenge in electronic information sharing is when different public organizations use different information systems with different platforms. Therefore, interoperability framework refers to compatibility standards of adopting information system among organizations (Santos and Reinhard, 2007; Bigdeli *et al.*, 2011). Moreover, data in the public organizations use different format and there is no organization ready to change the format of its data (Pardo and Tayi, 2007). Electronic information sharing is so difficult due to organizations follow different data definitions standards of data transmission (Jing and Pengzhu, 2007). Furthermore, organizations can solve these issues by integrating their information systems but that will cost a lot (Bhanti *et al.*, 2011).

Most public organizations have limitations of software, hardware and information sharing skills (Bhanti *et al.*, 2011). Thus, IT capability has been found as one of the main technological factors of information sharing in government sector. In general, IT capabilities are the ability of department to effectively apply IT tools to share information electronically with others (Akbulut *et al.*, 2009). Information quality also can improve the collaboration among departments and can enhance the quality of service (Klischewski and Scholl, 2008; Corradini *et al.*, 2006; Klischewski and Scholl, 2006).

Successful information sharing in inter-department collaboration strongly relies on the quality of the information. Information quality can improve the way the departments collaborate and enhance the quality of service delivery towards the public and improves the efficiency of interactions (Prybutok *et al.*, 2008).

Information quality play a key role in information sharing efforts, it is important that all participating players within governments have a common view about it (Bigdeli *et al.*, 2011). Moreover, information quality has a substantial influence on the information sharing among the agencies because information quality can affect the trust between these agencies (Dawes, 1996). Yang and Maxwell, 2011 likewise emphasize that information quality increases the trust of agency which in turn, increases electronic information sharing.

Based on the previous studies, there are some technological factors believed to affect EIS as have been explained above. Therefore, this research proposes advanced technological factors that can increase the participation of electronic information sharing. These advanced technological factors are three factors which depend on the techniques that technology can provide to increase the information sharing. The factors are data warehouse, cloud computing and social media.

**Data warehouse:** Data warehouse provides solutions for electronic information sharing issues because it establishes a platform for enhancing information sharing electronically (Corradini *et al.*, 2006; Mohammed *et al.*, 2014). The information sharing platform provides an environment of distribution and sharing which recognizes data management, query statistics, information publishing, user management and system maintenance (Xu and Sun, 2011). Government systems that rely on data warehousing techniques likewise enhance the effectiveness of process and analysis of huge government information, increase information sharing and support decision making (Huang *et al.*, 2010). Technology can survive the information age (Hu, 2010). Data warehouse use the historical data technique and also it new report and information by comparing the historical information with new information. Therefore, data warehouse can use to increase the information age. “Electronic information sharing can be obtained directly (such as electronic mail) or indirectly via information storage (for example: data warehouse)” (Akbulut *et al.*, 2009). The central information systems (as a data warehouse) might help government organizations to augment sharing of information among them (Yang *et al.*, 2014; Pardo and Tayi, 2007). Moreover, access of common repository (as a data warehouse) increases information sharing indirectly (Akbulut-Bailey, 2011; Akbulut *et al.*,

2009; Akbulut, 2003). Thus, the present study suggests the DW to be one of the factors that can be used to increase electronic information sharing between government organizations (Mohammed *et al.*, 2015; Alhadithi *et al.*, 2011). Hence, it is hypothesized that:

- H<sub>1</sub>: data warehouse has a significant effect on electronic information sharing between government organizations

**Cloud computing:** Some organizations in public sector have made early moves into cloud computing (Popovic and Hocenski, 2010). One of the most significant cloud computing opportunities for the public sector is the ability to share information and ICT resources among multiple agencies that lead mobile employees and teleworkers benefit from these applications which mean allowing users to use any device such as a Personal Computer (PC) or a Mobile phone, etc. Moreover, cloud computing provides an easier and less time to access information with more efficient and effective public sector. Cloud computing is able to drive and facilitate shared services by delivering services to multiple organizations in a common domain (Miskon, 2013; Lin *et al.*, 2009). These organizations that are willing to work in collaboration may deploy shared services on a cloud environment. Organizations use cloud computing to establish shared services centers in order to achieve large amounts of the job with cost savings and flexibility. When the organizations use cloud computing they get some benefits such as: helps in providing cost efficient data storage and file replication, higher security, reduced implementation and maintenance costs, enhanced collaboration that's mean increased accessibility, mobility, Flexible and scalable infrastructures (Jansen and Grance, 2011). Hence, it is hypothesized that:

- H<sub>2</sub>: cloud computing has a significant effect on electronic information sharing between government organizations

**Social media:** Social media plays an important role in information exchange (Hatala and Lutta, 2009). The advent of social media sites has created an environment of greater connection among people, businesses and organizations, serving as a useful tool to keep in touch and interact with one another. Social media sites have become an important method for public sector and its components to conduct outreach and share information with stakeholders (Dadashzadeh, 2010). In the public sector, the social media provides employee access that means employees at work can use social media sites

for the purposes of carrying out official business, professional development or any personnel interests and provides the ability for users to connect with each and share information or to achieve a common goal or interest and it is allow users to inexpensively immediately publish information in near real time (Hatala and Lutta, 2009; Dadashzadeh, 2010). In addition, the public sector can be used for exchanging opinions, provoking debate and sharing information about social and political problems. Additionally, social media has benefits of e-Governance by promoting, intensifying, improving and monitoring its offered services at reduced costs, increasing citizen usage of e-Services and e Participation and seeking public feedback, opinion, cooperation and collaborate across its geographically diverse citizens and thus increase transparency and trust on government.

These sites enable increased information sharing at a more rapid pace, building and enhancing relationships and helping coworkers to stay connected. Social media sites can also serve as a platform to enable persons and groups to express views on government and government agencies. Many government entities are also using social media sites as a tool to interact with the public (Zhang *et al.*, 2009). Hence, it is hypothesized that:

- H<sub>3</sub>: social media has a significant effect on electronic information sharing between government organizations

## CONCLUSION

Data, information and knowledge are the most important keys in the world, anyone has huge amount of them and manage them properly can control every world (e.g., politics, economic, marketing and so on). Thus, nowadays, the need of sharing these keys has been critically increased. Several researches have applied in order to found the factor that can increase and assist the participation of information sharing in public sectors. Therefore, many barriers have been examined such as individual, organizational, technological, environmental challenges. However, these studies has failed to discover all the factors of technological barrier, may be because the technology enhances fast in the 21 century. This study has been investigated three more technological factors named data warehouse, cloud computing and social media. These factors have been called advance technological factors because they based on the technique that include in the technology. These factors can increase the participation of information sharing. The applying these factors to increase and assist information sharing in government sector may needs resources such

as financial abilities special for adopting data warehouse technology. Social media factor considers as a ready platform thus, it can be more suitable to start with in developing countries. Moreover, mobile application should be used to share information because the smartphone currently are easy and friendly to use. Therefore, the adoption of factors will be based on the government abilities and capabilities. The factors need to be tested by quantitative, qualitative or mix methods. Moreover, another technological factors can be found as future work such as (metadata, big data or other technology). Finally, more suitable theories need to be tested in order to discover more technological factor that influence information sharing in public sector.

### REFERENCES

- Akbulut, A.Y., 2003. An investigation of the factors that influence electronic information sharing between state and local agencies. Ph.D. Thesis, Louisiana State University, Baton Rouge, LA., USA.
- Akbulut, A.Y., P. Kelle, S.D. Pawlowski, H. Schneider and C.A. Looney, 2009. To share or not to share? Examining the factors influencing local agency electronic information sharing. *Int. J. Bus. Inform. Syst.*, 4: 143-172.
- Akbulut-Bailey, A.Y., 2011. Information sharing between local and state governments. *J. Comput. Inform. Syst.*, 51: 53-63.
- Alhadithi, A., R.M. Idrus and A.S. Elameer, 2011. Re-Engineering Iraqi Higher Education With The E-Education Solutions. In: *Recent Researches in Education*, Zaharim, A., K. Sopian, N. Mastorakis and V. Mladenov (Eds.). WSEAS Press, Malaysia, pp: 37-42.
- Bhanti, P., U. Kaushal and A. Pandey, 2011. E-governance in higher education: Concept and role of data warehousing techniques. *Int. J. Comput. Appl.*, 18: 15-19.
- Bigdeli, Z., M. Kamal and S. deCesare, 2011. Inter-organisational electronic information sharing in local G2G settings: A socio-technical issue. *Proceedings of the European Conference on Information Systems*, June 9-11, 2011, Helsinki, Finland.
- Corradini, F., D.F. Angelis, A. Polzonetti and B. Re, 2006. Quality evaluation of e-government digital services. *Proceedings of the 2006 International Conference on Digital Government Research*, May 21-24, 2006, Digital Government Society of North America, San Diego, California, USA., pp: 377-378.
- Dadashzadeh, M., 2010. Social media in government: From eGovernment to eGovernance. *J. Bus. Econ. Res.*, 8: 81-86.
- Dawes, S.S., 1996. Interagency information sharing: Expected benefits, manageable risks. *J. Policy Anal. Manage.*, 15: 377-394.
- Estevez, E., P. Fillotrani and T. Janowski, 2010. Information sharing in government-conceptual model for policy formulation. *Proceedings of the 10th European Conference on eGovernment*, June 17-18, 2010, National Centre for Taxation Studies and University of Limerick, Ireland, pp: 152-162.
- Hatala, J.P. and J.G. Lutta, 2009. Managing information sharing within an organizational setting: A social network perspective. *Perform. Improvement Q.*, 21: 5-33.
- Hu, X., 2010. Data Warehouse Technology and Application in Data Centre Design for E-government. INTECH Open Access Publisher, Rijeka, Croatia, pp: 371-383.
- Huang, T., A. Dang, H. Cheng, X. Peng and Z. Zhu, 2010. Digital urban planning oriented data warehouse constructing supported by GIS: Taking Greater Beijing regional planning as a case. *Proceedings of the 18th International Conference on Geoinformatics*, June 18-20, 2010, Beijing, China, pp: 1-5.
- Jansen, W. and T. Grance, 2011. Guidelines on security and privacy in public cloud computing. *NIST. Spec. Publ.*, 800: 10-11.
- Jing, F. and Z. Pengzhu, 2007. What factors influence the information sharing across government agencies? *Proceedings of the 2007 International Conference on Service Systems and Service Management*, June 9-11, 2007, Chengdu, pp: 1-4.
- Jing, F., P. Zhang and D.C. Yen, 2014. G2G information sharing among government agencies. *Inform. Manage.*, 51: 120-128.
- Kamal, M.R., D.S. Singh, V. Singh and K. Ahmad, 2012. Factors influencing interdepartmental information sharing practice in electronic government agencies. *Proceedings of the Knowledge Management International Conference*, July 4-6, 2012, Johor Bahru, Malaysia, pp: 292-298.
- Klischewski, R. and H.J. Scholl, 2006. Information quality as a common ground for key players in e-government integration and interoperability. *Proceedings of the 39th Annual Hawaii International Conference on System Sciences (HICSS'06)*, January 4-7, 2006, IEEE, Cairo, Egypt, ISBN: 0-7695-2507-5, pp: 72-72.
- Klischewski, R. and H.J. Scholl, 2008. Information quality as capstone in negotiating e-government integration interoperation and information sharing. *Electron. Government Int. J.*, 5: 203-225.

- Lam, W., 2005. Barriers to e-government integration. *J. Enterprise Inform. Manage.*, 18: 511-530.
- Lin, G., D. Fu, J. Zhu and G. Dasmalchi, 2009. Cloud computing: IT as a Service. *IT Professional*, 11: 10-13.
- Miskon, S., 2013. ICT shared services in the higher education sector: Foundations, benefits, success factors and issues. Ph.D. Thesis, Queensland University of Technology, Queensland.
- Mohammed, M.A., I. Huda and M.N. Maslinda, 2014. Electronic information sharing to improve decision making in public universities. *Asian J. Applied Sci.*, 2: 957-963.
- Mohammed, M.A., I. Huda and M.N. Maslinda, 2015. Electronic information sharing between public universities and ministry of higher education and scientific research: A pilot study. *J. Theoret. Applied Inf. Technol.*, 77: 1-13.
- Pardo, T.A. and G.K. Tayi, 2007. Interorganizational information integration: A key enabler for digital government. *Govt. Inform. Quart.*, 24: 691-715.
- Popovic, K. and Z. Hocenski, 2010. Cloud computing security issues and challenges. Proceedings of the 33rd International Convention on Information and Communication Technology, Electronics and Microelectronics, May 24-28, Opatija, Croatia, pp: 344-349.
- Prybutok, V.R., X. Zhang and S.D. Ryan, 2008. Evaluating leadership, IT quality and net benefits in an e-government environment. *Inform. Manage.*, 45: 143-152.
- Santos, D.E.M. and N. Reinhard, 2007. Setting interoperability standards for e-government: An exploratory case study. *Electron. Government Int. J.*, 4: 379-394.
- Xu, Q. and Q. Sun, 2011. The research of information sharing platform based on data warehouse in fossil power plant. Proceedings of the 2011 International Conference on Computational and Information Sciences ICCIS, October 21-23, 2011, IEEE, Chengdu, China, ISBN: 978-1-4577-1540-2, pp: 227-229.
- Yan, Z., B. Sun and T. Wang, 2009. A study on information sharing of e-government. Proceedings of the IEEE International Conference on Grey Systems and Intelligent Services, November 10-12, 2009, Nanjing, China, pp: 1331-1335.
- Yang, T.M., T. Pardo and Y.J. Wu, 2014. How is information shared across the boundaries of government agencies? An e-Government case study. *Govt. Inform. Quart.*, 31: 637-652.
- Zhang, W., T.J. Johnson, T. Seltzer and S.L. Bichard, 2009. The revolution will be networked: The influence of social networking sites on political attitudes and behavior. *Soc. Sci. Comput. Rev.*, Vol. 1, 10.1177/089443930933516.