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What to Share and Why to Share? A Case Study of Cross-Boundary Information Sharing in Taiwan e-Government

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Abstract

In the public sector, cross-boundary information sharing has been an important theme among governmental collaboration and is critical to organizational efficiency and performance. This research explores the types and characteristics of shared information and the intended purposes of information sharing. In the case study, the cross-boundary shared information can be abstracted into five fundamental types: the collected raw data, the value-added information, the administration-oriented information, the administration-oriented knowledge, and the domain-oriented knowledge. Another framework is proposed to conceptualize the purposes of interagency information sharing. The identified seven purposes are administrative work, information search and verification, information aggregation, business process chain, innovative service, experience-based knowledge sharing, and crisis and emergency. The seven purposes do not mean to be an exhaustive list but to provide an initial conceptualization to perceive the functionalities and roles that cross-boundary information sharing plays among government agencies. The two proposed frameworks can help both researchers and practitioners perceive and clarify the fundamental part of cross-boundary information sharing in the public sector. The finding of this research is also expected to enrich the current information-sharing theories and to contribute to the current e-Government literature from an international perspective.

Keywords: Boundary; Information Sharing; Electronic Government; Taiwan

1. Introduction

1.1 Electronic government (e-Government)

With the development of information and communication technologies, e-Government has become an important strategy for governments to attain better effectiveness and efficiency (Dawes, 1996, 2008, 2009; Fountain, 2001; Gil-Garcia, Chengalur-Smith, & Duchessi, 2007; Pardo & Tayi, 2007; Zhang & Dawes, 2006). Governments have adopted information and communication technologies (ICT) to improve their daily operations to reduce expenses and increase the quality of services. According to McClure (2000), "Electronic government refers to government's use of technology, particularly web-based Internet

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applications to enhance the access to and the delivery of government information and service to citizens, business partners, employees, other agencies, and government entities." Similarly, researchers in academia also define e-Government as the delivery of government services (information, interaction, and transaction) through the use of information and communication technologies (Bekkers, 2007; Moon, 2002). By using a broader definition, Dawes (2009) suggests that e-Government should also engage with matters of social and human needs and capabilities, dynamic interaction among social and technical developments, and the values and institutions that underlie democracy.

1.2 Cross-boundary information sharing in e-Government

To help understand the development and complexity of e-Government, several stage-models have been proposed by researchers (Klievink & Janssen, 2008, 2009; Layne & Lee, 2001; Siau & Long, 2005). Layne and Lee (2001) observe that, during the developing stage of e-government, most government information systems are separate and fragmented. Progress toward the integration of scattered systems across different levels (vertical integration) and different functions (horizontal integration) of government service is necessary, because requested services from citizens usually need to retrieve information from several agencies with different functionalities. The need for information sharing and integration exists not only across different levels of government agencies but also among government agencies with different functionalities.

Another stage model is proposed by Klievink and Janeesn (2008, 2009) to conceive e-Government collaboration from a single organization level to a national-wide level. They claim that although many government agencies have integrated services within respective agencies, citizens and business still need to interact with several different government agencies to acquire desired services. Therefore, they assert there is an urgent information-sharing need for both the vertical and horizontal integrations of information systems operated by various government agencies. Furthermore, Siau and Long (2005) also agree that both vertical and horizontal integration of government services are critical. They believe that the success of e-Government to provide integrated and seamless services relies on the cooperation and collaboration among government agencies of different levels, functionalities, and various physical locations. They suggest that information sharing and integration of government databases and separate systems is necessary to improve internal organizational

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management of government agencies to provide better external public services (Siau & Long, 2005).

Groznik and Trkman (2009) observe that it is relatively easy to achieve the early stage of e-Government, where information services are introduced, and where few changes to the internal operations of administration and business processes and procedures of governments are necessary. However, when entering the later stages of e-Government development, changes are more complex because of various needs such as renovation of administrative operation and business process, synthesis of different public databases, alteration and completion of legislation, and development of new organizational regulations (Groznik & Trkman, 2009). As Gil-Garcia and Pardo (2005) point out, the scope of information sharing and integration can range from problem solving in specific programs to the need for enterprise capacity building in participating organizations. The complexity of information sharing and integration also gradually increases from the organizational level, the inter-organizational level, to the inter-governmental level (Gil-Garcia & Pardo, 2005).

1.3 Define cross-boundary information sharing

Harris (2000) asserts that information integration means different things to different people in different contexts. Barki and Pinsonneault (2002, 2005) claim that despite the widespread interest regarding the topic, the concept continues to be poorly conceptualized. They define cross-boundary information sharing and integration as the collaboration or interconnection of different information systems or telecommunication technologies to share data with a common conceptual schema between entities such as groups, departments, and organizations (Barki & Pinsonneault, 2002, 2005). Landsbergen and Wolken (2001) further point out that cross-boundary information sharing and integration actually represents interoperability across different organizations. In addition, Dawes, Cresswell, and Pardo (2009) indicate that when there are public needs that no single organization or jurisdiction can handle alone, cross-boundary information sharing and integration help organizations move from a “need to know” default option to a “need to share” network culture.

According to Gil-Garcia, Pardo, and Burke (2010), information sharing and information integration are often considered closely related but distinct concepts. However, both concepts converge when an integrated information system provides more comprehensive data shared among contributors. They provide preliminary definitions of the four components of cross-boundary information sharing and integration,

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and thus offer a foundation for discussion. The proposed four components are: a) trusted social networks; b) shared information; c) integrated data; d) interoperable technical infrastructure, which cover both technical and social aspects (Gil-Garcia, Pardo, & Burke, 2008).

a. Trusted Social Networks: Networks of social actors who know each other and trust each other.
b. Shared Information: Sharing of tacit and explicit knowledge in the form of formal documents, informal talks, e-mail messages, faxes, etc.
c. Integrated Data: Integration of data at the level of data element standards and/or industry/community data standards (e.g., XML).
d. Interoperable Technical Infrastructure: Systems that can communicate with each other at the hardware/operating system level.

2. What is Cross-Boundary Shared Information?

As defined by Gil-Garcia et al. (2010), integrated data and shared information are two of the four components that consist of cross-boundary information sharing. Within this definition, cross-boundary shared information can be referred to data and information, and tacit and explicit knowledge is also included. Similarly, other researchers (Klischewski & Scholl, 2008; Nonaka & Takeuchi, 1995; Scholl, 1999) also suggest that information sharing is not only confined to codifiable information and explicit knowledge, but also includes tacit knowing. While data, information, and knowledge are all counted as cross-boundary shared information, a more thorough discussion to distinguish among data, information, and knowledge is presented in the following subsection.

2.1 Data, information, and knowledge

In the literature, data are defined as streams of raw facts before being arranged into a form that people can understand and use (K. C. Laudon & Laudon, 1998; L. Long & Long, 1998). Data are comprised of facts (Hayes, 1992) and are considered recorded symbols (McNurlin & Sprague, 1998). Data can be represented in forms such as numbers, words, figures, and voices, be collected through various approaches including observation, experiment, and research, and be applied to generate reports, graphs, and statistics (Kendal & Creen, 2006). On the other hand, information is the property of data and is obtained after data is processed, shaped, and transformed into a structural form that is meaningful, useful and understandable to human beings (Harry, 1994; Hayes, 1992; Laudon & Laudon, 1998; Senn, 1990). It is also suggested that information is the meaning assigned to accumulated facts (Long & Long, 1998) and the data endowed

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with relevance and purpose (Drucker, 1988). Furthermore, knowledge is defined as the result of the understanding of information (Hayes, 1992). Knowledge is the collected information about an area of concern (Senn, 1990), and is the information internalized with direction or intent to facilitate a decision or an action (Hayes, 1992; Zachman, 1987). According to Polanyi (1966), there are two types of knowledge, explicit and tacit. Explicit knowledge is objective and rational knowledge that can be expressed in words, numbers, formulas, or charts. Tacit knowledge is subjective and experience based knowledge that is difficult to express and communicate. Tacit knowledge is context-specific and includes cognitive skills such as belief and intuition, and craft skills such as know-how.

Overall, an interrelated connection is perceived among data, information, and knowledge. According to Kendal and Creen (2006), data are important asset for an organization and can be further processed into useful and meaningful information to facilitate decision making. They also indicate that knowledge is what someone possesses after understanding information. Data, information and knowledge are not static things and can be considered points along a continuum. The movement from data to knowledge also implies a shift from facts and figures to more abstract concepts (Kendal & Creen, 2006).

2.2 What to share and why to share?

In e-Government, cross-boundary information sharing has been recognized as a complex task when agencies and organizations with different cultures and missions are involved. Different factors such as barriers and enablers influencing interagency information sharing have been identified and discussed extensively from multiple perspectives (Yang & Maxwell, 2011; Yang, Zheng, & Pardo, 2012). However, there is still limited research focusing on the understanding and differentiation of types and characteristics of cross-boundary shared information and the intended purposes of information sharing. To fill this gap, the paper provides a deeper analysis to understand the phenomenon. Specifically, the following two questions were investigated and formed the foundation of this exploratory inquire:

- What are the types and characteristics of cross-boundary shared information in the context of e-Government?
- Depending on different types of shared information, what are the purposes of cross-boundary information sharing in the context of e-Government?

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3. Research Method and Selected Case Study

Taiwan has started developing its e-Government since 1997. In the past decade Taiwan has focused its effort on developing initiatives of cross-boundary information sharing and integration. According to the reports from the Research, Development and Evaluation Commission (Note 1), "E-government in Taiwan has established a solid foundation after a decade's development. Current focus has been on cross-agency service integration and the promotion of integrated e-services" (Research, Development and Evaluation Commission [RDEC], 2008). Nowadays, as e-Government evolves to e-Governance, sustainability of interagency information sharing and integration has become a critical foundation. Because of its commitment to a broadly based change process, Taiwan e-Government and its past and ongoing development in cross-agency shared services make a good case for this study to explore the proposed research questions. In addition, most research in cross-boundary information sharing and integration is conducted in the context of western countries such as the United States and Europe. Investigation in Taiwan also provides new insight and contributes to the information-sharing literature from an international perspective.

3.1 The selected case

While the case in the study is selected from the context of Taiwan e-Government, in particular, a case study of the e-Networking Project of Government Online Service was developed and then used in the research. This project was a sub-plan of the Challenge 2008- Taiwan National Development Plan proposed by the Cabinet of Taiwan in 2002, and the duration of the project was from 2002 to 2007. The project was to provide integrated services to the public, private firms, public organizations, and also government agencies through cross-boundary information sharing and integration across several major information systems with other government agencies. Those major information systems include Household Registration Information System (HRIS), Land Administration Information System (LAIS), Financial Taxation Information System (FTIS), Commerce Information System (CIS), and Motor Vehicle & Driver Information System (MVDIS). These five systems are the backbone information systems and the foundation of Taiwan e-Government. Most government agencies of Taiwan have to acquire information periodically from the five major information systems to run their operations.

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3.2 Data collection and data analysis

The research explored the case through both the vertical and horizontal networks in the context of Taiwan e-Government. Qualitative data were collected through semi-structured interviews with the key actors from central and local government agencies who participated in the related initiatives. A purposive sampling by using snowball sampling methodology was adopted to identify relevant interviewees. The first interviewee was the deputy minister of the RDEC of Executive Yuan (the cabinet) of Taiwan. This key informant helped the researcher of the study to identify the key players who participated in the e-Networking Project of Government Online Service. In the later stages, the identified key players also helped the researcher to locate other key actors.

There were total twenty-eight interviewees, and the interviewees can be categorized into three groups, central government agencies, local government agencies, and private and non-profit organizations. Eighteen participants are from central government agencies where they hold different positions such as deputy minister, director, deputy director, section chief, technical specialist, IT director, and IT consultant. Five participants are from local government agencies where they hold positions such as deputy director, section chief, and specialist. The last five participants come from private and non-profit organizations which help the government to establish various information systems to assist cross-boundary information sharing in the project, and they hold positions such as president, vice president, department director, division head, and department manager. With various professional backgrounds, the twenty-eight participants play important roles in the different parts of the project and provide rich information to the researcher to realize the information-sharing activities of the project.

The interview data were transcribed and analyzed by using grounded theory techniques to identify theoretical patterns and frameworks. Strauss and Corbin (1998) suggest three types of coding, open coding, axial coding, and selective coding, to analyze and interpret qualitative data. Open coding is the process of breaking down, comparing, conceptualizing, and categorizing data by comparing the acquired data for similarities and differences. Axial coding is the following step of open coding. The purpose of axial coding is to further classify and categorize the initial codes produced in open coding. Codes that are conceptually similar are grouped together. The main categories and sub-categories or concepts can be the representation of a set of axes that can reveal the patterns and relationships of analyzed data. Lastly, selective coding is to explain the relationship among the identified concepts to be coherent

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with the observed phenomenon of the study. Selective coding is considered complete when the theoretical saturation is achieved. During the data analysis, the qualitative software tool (Atlas-ti) is employed to support coding and analysis activities. In addition, government documentation and reports, and related newspapers articles and reports from non-governmental organizations were collected and reviewed.

4. The Types of Cross-Boundary Shared Information

In the case study, it is observed that different types of information with various characteristics are shared across boundaries. The cross-boundary shared information in the case study can be identified and abstracted into five major types, the collected raw data, the value-added information, the administration-oriented information, the administration-oriented knowledge, and the domain-oriented knowledge.

4.1 The collected raw data

The collected raw data is defined as the data collected directly or indirectly from the public and private enterprises by government agencies for the purposes of regular governmental operations or emergent issues such as national security or crisis. When prepared and shared to other agencies, the collected raw data are usually shared directly without going through any value-added process or analysis. In the case study, the Department of Household Registration is the authorized government agency to collect household information from the public. The collected household information such as name, identification number, and address are stored directly in relational databases. Similarly, the Financial Data Center collects tax information such as income from the public, and the Department of Commerce collects registration information from private enterprises. All the aforementioned information is usually shared from the agencies in charge to others in original forms without applying any value-added process or analysis and therefore belongs to the type of collected raw data. Some interviewees stated:

> *A section chief of a central government agency:* "…The public go to local government agencies to update their land or household registration information. The information collected by the local government agencies is then directly shared to relevant central government agencies in a daily base…."
>
> *A project manager of an IT company:* "…What government agencies want in cross-boundary information sharing is mostly

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the primitive information. I mean what they want is the originally collected data rather than the analyzed result by other agencies. So the shared information is mostly in the form of collected raw data…."

4.2 The value-added information

Based on the collected raw data, the value-added information is the information that is further analyzed, processed, and refined with the domain knowledge of a government agency before being shared to other government agencies. In the case study, demographic information is generated from the database of the Department of Household Registration by putting the collected raw data into statistical analysis. Similarly, the land information gathered by the Department of Land Administration is further analyzed and integrated into a geographic information system. The integrated land information is the combination of the collected raw data from several sources and is then shared to other agencies to facilitate decision makings. Therefore, for information providers who provide value-added information, it is necessary to customize collected raw data to fulfill the needs of information requestors. Some interviewees pointed out:

A section chief of a central government agency: "…Some agencies may request information that is not exactly the data stored in our database. So we can't just pour data from our database and share them. We have to write some computer programs to filter what we have to customize the shared information…."

A section chief of a central government agency: "…Sometimes we can't immediately response to what other government agencies ask for. We have to analyze the information we have and also to acquire some information from others in order to produce the information that fits what the other agencies ask for…."

4.3 The administration-oriented information

The administrative-oriented information is defined as the administrative information flowing from one agency to another. The administrative information can be information regarding governmental documents, meetings, activities, etc. The information can be in the form of paper-based or electronic information. In addition, the administrative information can also include private organizations and the public as its recipients to receive governmental information. The administration-oriented information is different from the collected raw data and the value-added information. The administration-oriented information can be imagined as glue or signals that connect government agencies to run their daily operations appropriately. An interviewee stated:

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> *A project manager of an IT company:* "… I think information sharing also includes the interactions between government agencies in the exchange of governmental documents, message notifications, and policy information, etc. Recently, the RDEC is running a trial project to encourage and gradually require the using of electronic official documents among government agencies. The electronic information can be the official governmental document, notifications, and other original paper-based administrative information…."

4.4 The administration-oriented knowledge

The administration-oriented knowledge is defined as the general knowledge that can be applied to government agencies' daily administrative operations. In the case study, government agencies use an Electronic Documents Exchange System (EDES) to interchange governmental documents among different agencies. There is an EDES knowledge management (KM) platform for agencies to share experience regarding what problems they may encounter and how to overcome the problems when using the system. The shared knowledge on the KM platform can be adopted by other agencies to enhance their experience in using EDES to exchange documents. In addition, although government agencies have respective core business, they encounter the same issues such as information security or other similar administrative processes. Therefore, government agencies also share knowledge and experience to apply to similar administrative operations or encountered problems. Some interviewees indicated that:

> *A deputy director of a central government agency:* "…Government agencies have to build their infrastructure to connect to the Government Service Network. The information sharing from other agencies can help us know how to setup the connection and keep the cost down. The experience sharing from other agencies also helps us build a strengthened infrastructure to face challenges of information security…."
>
> *A section chief of a central government agency:* "…Knowledge sharing can be the sharing of knowledge accumulated from the operation experience of agencies. An agency can share its knowledge regarding how to setup a project. What are the steps, how to organize, and how to execute the project? I think those are good information to share to other agencies…Recently the RDEC is encouraging government agencies to have

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organizational reengineering. Any shared knowledge or experience by an agency having gone through the process will be very helpful…."

4.5 The domain-oriented knowledge

The domain-oriented knowledge is defined as the core-business knowledge of a government agency. Each government agency has core business, and specific domain knowledge is established. For instance, taxation administration and land administration are two different domains having respective knowledge to run core business. The domain-oriented knowledge is gradually formed and accumulated in the daily operation of a government agency. Usually, the sharing of domain-oriented knowledge is more limited within the boundary of an agency itself or business-related agencies of the same ministry. Two interviewees pointed out that:

> *A deputy director of a central government agency:* "…Our definition of cross-boundary information sharing in knowledge is quite limited. In addition to having our knowledge sharing within our own agency, we only try to share some of the knowledge to few related agencies such as the agencies in national tax administration. Other than that, we don't have knowledge sharing with other agencies…."
>
> *A section chief of a central government agency:* "…Regarding information sharing in knowledge, we only have knowledge sharing within our agency. I think it is very rare for us to share knowledge to other agencies. I think it is complicated and there are some concerns. Every government agency has different domain knowledge, so the demand to have knowledge sharing among government agencies should be relatively low…."

4.6 The identified five types of the shared information

In the case study, in addition to the administration-oriented information, most of the cross-boundary shared information is in the type of collected raw data and then is in the type of value-added information. The frequency of information sharing in the type of administrative-oriented knowledge and domain-oriented knowledge is lower. Especially for the domain-oriented knowledge, the frequency to share the domain-oriented knowledge across the boundaries of different agencies is relatively low in the case study and is more limited within a single government agency or few business-related agencies of the same ministry. The following discussion explains why the domain-oriented

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knowledge is the least shared information across boundaries of government agencies.

The domain-oriented knowledge is usually the professional knowledge of a government agency. For instance, the professional knowledge in the Department of Land Administration is very specialized, and someone with related discipline or education is needed to understand the shared domain-oriented knowledge. Each government agency has its core business and therefore has unique domain knowledge to run its operation. The Financial Data Center has core business and domain-oriented knowledge that is very different from what the Department of Land Administration has. The information sharing in the type of domain-oriented knowledge between the two agencies may be less effective and less realistic. However, the collected raw data and the value-added information of the Department of Land Administration are critical to the efficiency and effectiveness of the core business of the Financial Data Center. The information can reduce the effort and time of the Financial Data Center to collect land information for taxation purpose. The tax revenue also increases because the shared information from the Department of Land Administration is relatively more accurate and comprehensive than what was collected by the Financial Date Center. Some interviewees indicated:

An IT director of a central government agency: "…The current interagency information sharing focuses on data sharing rather than on knowledge sharing. In the current stage, we may just share knowledge and experience that is more administrative based…I think knowledge sharing can happen between central and local government agencies having the same core business. For government agencies having different core business, I think knowledge sharing is more difficult. Unless knowledge sharing is for a more general issue such as organizational reengineering…."

A section chief of a central government agency: "…The information sharing we have is to share data retrieved directly from our databases. We don't have knowledge sharing with other government agencies. I don't think other government agencies need our knowledge to apply to their core business…."

In addition, while the domain-oriented knowledge derives from the core business of a government agency, it is closely related to its operational procedures. Some domain-oriented knowledge may be sensitive to information security issues and is prohibited from sharing to other agencies. An interviewee stated:

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> *A section chief of a central government agency:* "…Currently the information sharing we have to other agencies is data sharing. It will be more complicated to have knowledge sharing while some agencies have concerns in information security issues…."

According to the interviewees, the sharing of domain-oriented knowledge is also difficult especially for the sharing of tacit and implicit knowledge. For some government agencies, the sharing of domain-oriented knowledge is already a challenge within their own boundaries. It is even more difficult for them to have domain-oriented knowledge sharing across the boundaries of different agencies. Two interviewees stated:

> *A section chief of a central government agency:* "…Some people have concerns in sharing their knowledge, experience, and know-how to others. They believe that the sharing of their know-how to others may jeopardize their careers. Furthermore, the sharing of know-how can't be easily expressed in words and usually takes a lot of time in interactions…."
>
> *An IT consultant of a central government agency:* "…it is very difficult to have someone share his or her domain know-how and put the know-how in electronic form on a knowledge-sharing information system. How come one is willing to share know-how to others? I think the sharing of administrative-related knowledge and experience could be more realistic, and it has not been an easy job…."

In the case study, the cross-boundary shared information is abstracted into five different types (see Figure 1). In addition to the administration-oriented information, the collected raw data is the major type of the shared information across boundaries of different agencies. Then the type of value-added information follows. The administration-oriented knowledge is also shared among agencies, but the frequency is lower. Lastly, the domain-oriented knowledge sharing is usually limited within a government agency or few agencies having closely connected core business.

5. The Characteristics of Cross-Boundary Shared Information

When the collected raw data and the value-added information are the major types of the cross-boundary shared information of the case, the information can be further categorized according to its characteristics. The shared information can be classified to either privacy

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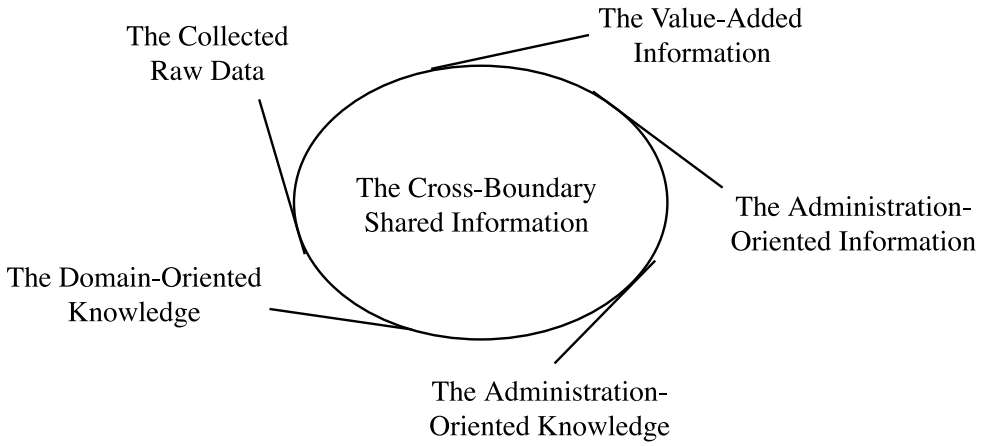


Figure 1. The Identified Five Types of Cross-Boundary Shared Information

and confidentiality related information or public safety related information, or the information that can be open to the public.

5.1 The privacy and confidentiality related information

In the case study, the shared information among agencies usually contains human-specific information or organization-specific information that is sensitive to privacy and confidentiality. The information is usually prohibited from sharing to the public and is strictly controlled in the governmental level. For instance, the information from the Department of Household Registration is highly related to personal privacy. The information contains detailed personal information such as name, date of birth, permanent address, phone number, and national identification number, etc. The information from the Financial Data Center is also highly sensitive. The information contains personal tax information such as income, property, rent, and interest and corporation tax information such as revenue and net income. Similarly, the information from the Department of Land Administration also contains sensitive information such as the registration information of land owners.

5.2 The public information

Some shared information can be open to the public and other agencies without the concerns of information privacy and confidentiality. For instance, the Department of Household Registration has demographic information that can be shared to the public and other agencies for decision making. The Department of Land Administration shares

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its land information through its geographic information system to other agencies for value-added purposes. The Department of Commerce also shares the business registration information to the public and other agencies to check and confirm whether a company is officially and legally registered to run its business.

5.3 The public safety related information

The information is classified to national security and is strictly controlled to be shared within few agencies. In addition, the information can be related to public safety in health concerns, and the sharing of the information can override the priority of information privacy. For instance, in 2003, there was a SARS outbreak in Taiwan, and the personal information of the infected and suspected SARS patients was quickly collected and distributed through an emergent information sharing systems among related agencies such as the Custom, the Department of Household Registration, the Department of Health, and hospitals to track and locate the patients for further potential treatments and quarantines.

5.4 The identified characteristics of shared information

In the case study, most of the collected raw data and the value-added information are related to privacy and confidentiality. Those shared data and information are critical to facilitate government agencies to efficiently run their operations and can help them to create innovative services to the public. However, it is not easy for an agency to acquire information from other agencies especially when the information is highly privacy and confidentiality related. Government agencies tend to have strict control to share their information. As some interviewees stated:

> *A section chief of a central government agency:* "…In our database, we store personal information. The information is the fundamental data of people. It is the data with high personal privacy. The information is strictly controlled and cannot be shared to other agencies without careful scrutiny…."
>
> *A vice president of an IT company:* "… the Financial Data Center is usually more conservative and hesitant to share its information to other agencies, because its information can include personal property that is very sensitive to personal privacy. Its regulation also has strict control regarding whom it can share information to…."

In the case study, the majority of the shared information is in the types of collected

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raw data and value-added information. Based on the characteristics of the shared information, the information of the two types can be further categorized into three groups, the privacy and confidentiality related information, the public open information, and the public safety related information (see Figure 2). The shared information of the two major types in the case is more related to privacy and confidentiality because the five information systems all deal with the fundamental information of people and business such as household registration information, land information, taxation information, and business registration information. Therefore, the cross-boundary shared information among agencies in the case study is more privacy-and-confidentiality related.

6. The Purposes of Cross-Boundary Information Sharing

Through cross-boundary information sharing, government agencies can become more efficient in running daily business. As aforementioned in subsection 4.3, administrative information sharing is to facilitate administrative work among agencies. Then the question is raised: What are the other purposes that agencies need to acquire information from others? What are the functionalities that cross-boundary shared information can be to help agencies? In the case study, in addition to administrative work, the purpose of cross-boundary information sharing can be further classified into six types, information search and verification, information aggregation, business process chain, innovative service, experience-based knowledge sharing, and crisis and emergency.

6.1 Information search and verification

According to the interviewees, this situation usually happens when one government agency needs information from another government agency for the purpose of information search

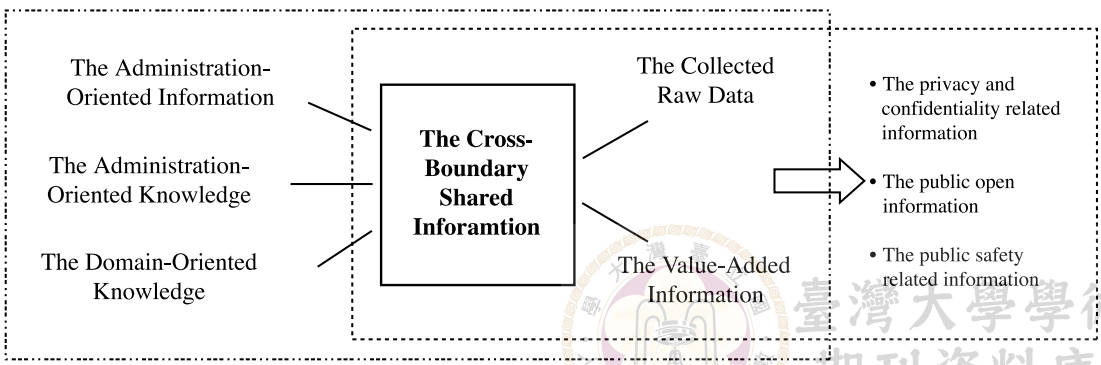


Figure 2. The Types and Characteristics of Cross-Boundary Shared Information

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and verification. The two agencies may act independently and do not have business process connected. Because the information need is very specific for an explicit record, only a limited amount of information is needed, and the shared information is usually transmitted in real time. In addition, the frequency of information sharing in this situation is high. In the case study, the Department of Household Registration does not have connected business process with the Department of Land Administration. However, when someone comes to a local office of the Department of Land Administration to apply for a public service, the Department of Land Administration will search and acquire the specific information of the person from the Department of Household Registration for verification purpose. Although the applicant also provides personal identification for verification, the retrieved information from the Department of Household Registration is considered the authoritative and reliable information to verify with what is provided by the applicant. As interviewees stated:

> *A section chief of a central government agency:* "…We provide an interface that other government agencies can connect directly through the government service network to search some specific information that we open to share… Although the other government agencies may have the same information, we have the up-to-date information for them to compare and verify…."
>
> *A section chief of a central government agency:* "…We will retrieve information from the Department of Household Registration to verify the identification of the applicant. In addition to check the documents the applicant provides, we need to verify his identification with the retrieved information from the Department of Household Registration. It is possible that the applicant provides fake or out-of-date information…."

6.2 Information aggregation

Information aggregation is different from information search and verification in the amount and details of information needed. In this situation, government agencies may also act independently without business process connected. However, one agency may need to integrate the information from other agencies to increase the efficiency and effectiveness of its business operation. Usually the amount of shared information is fairly large because detailed information of thousands of records from other agencies is needed. The frequency of information sharing is usually lower when compared with that of information search and

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verification, and the transmission of information is not in real-time due to the large amount of information required and the customization needed. For instance, the shared information from the Department of Land Administration and the Department of Household Registration is very helpful to the Financial Data Center to run its taxation business. By periodically integrating and analyzing the shared information from the two agencies, the Financial Data Center can effectively increase it taxation revenue and efficiently save a lot of time rather than collect the information by itself. The shared information from the two authoritative agencies is also considered being more accurate and up-to-date. Two interviewees said:

> *A section chief of a central government agency:* "…Another type is the need of detailed information rather than the simple purpose of search and verification… Usually the amount of shared information is large and the frequency of information sharing is low. We may use tape or other media to share information…."
>
> *A deputy director of a central government agency:* "…In some special projects and our regular operations, we need to acquire a lot of information from the Department of Household Registration and integrate the information into our systems. The agency is defined as an upstream information provider…."

6.3 Business process chain

The situation happens when different government agencies have their business processes connected. It can happen to agencies having either the same core business or different core business. In the case study, for local and central government agencies having the same core business, local Household Registration Offices share their gathered information to the county and central Household Registration agencies in a daily base. On the other hand, a business process chain also forms by integrating agencies having different core business. In the case study, an online registration for a company can have information flow through several government agencies. The registration information has to go to the Department of Commerce to apply for the establishment of a company. The processed information has to be sent to the Financial Data Center for the future taxation purpose. Then the information is further sent and shared to other related agencies in this "company-registration" business process chain. An interviewee stated:

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> *A project manager of an IT company:* "…The agencies of National Tax Administration and the agencies of Local Tax Bureau share their information to the Financial Data Center because the agencies have the same core business and are in a business process chain. There is a fairly large amount of information shared among the agencies…A business process can be very complicated and go across several government agencies. The information flow is the processed information passing from one agency to another…."

6.4 Innovative service

This purpose is similar to the two aforementioned purposes, information search and verification and information aggregation. However, an innovative service is not the originally established public service of government agencies. Rather, an innovative service is a newly created service by an agency and is usually in the stage of experiment. In order to provide an innovative service, an agency usually needs to acquire information from other agencies for the purpose of information search, verification, or aggregation. Some interviewees claimed that it is more difficult for an agency to achieve cross-boundary information sharing to sustain an innovative service because other agencies are not liable to provide information. Not only an innovative service is not yet the core business of the agency which creates it, but there is also no established business process of the innovative service among agencies. An interviewee stated:

> *A project manager of an IT company:* "…What we care is the better utilization of the shared information from other government agencies. We have many thoughts regarding what we can do. The more information we can get from other agencies, the more we can create innovative services to the public… However, most agencies may not share their information to us just because we come up with an innovative service and hope to put it into work…."

In the case study, Small and Medium Enterprise Administration (SMEA) is the government agency to facilitate the development of small and medium companies. An innovative service is proposed by the agency to help small and medium companies to acquire bank loans. It is usually difficult for small and medium companies to acquire bank loans because of bad records that some companies provided false information to banks for acquiring more loans. Therefore, the submitted application

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information from small and medium companies such as balance sheet, revenue, and taxation information cannot earn the trust from banks due to the lacking of information transparency. In order to eliminate the information asymmetry between the companies and banks, SMEA creates an innovative service to help banks to acquire more accurate information. With the authorizations from the participating companies, SMEA requests information sharing from the Department of Commerce, the Financial Data Center, and other related agencies, and the acquired information is then shared to banks. In this innovative service, the cross-boundary shared information such as company registration information and taxation information from the authoritative agencies can help eliminate the information asymmetry between the companies and banks. Therefore, small and medium companies can have a better chance to acquire bank loans.

6.5 Experience-based knowledge sharing

According to the interviewees, this purpose is to have government agencies share their administration-oriented knowledge and domain-oriented knowledge accumulated in their daily administrative operations and core business. As aforementioned, knowledge sharing from one agency can help other agencies to resolve similar administrative problems such as how to use to a certain information system or how to build a secured computer network infrastructure. Or knowledge sharing can apply to issues that every agency may encounter such as organizational reengineering. Knowledge sharing also happens to agencies having the same or related core business. The shared knowledge can help the agencies run their core business more efficiently. While the collected raw data and value-added information are to provide records of data and information to help agencies to "be able" to do their business more efficiently, the administration-oriented and domain-oriented knowledge is to provide explicit and tacit knowledge to help agencies to "know how" to do their business more efficiently. An interviewee stated:

> *A section chief of a central government agency:* "…A government agency can share its knowledge regarding how to setup a project. What are the steps, how to organize, and how to execute the project? I think those are good information to share to other government agencies…Recently the RDEC is encouraging organizational reengineering to make an agency more efficient. Any shared knowledge or experience by an agency which has gone the process will be very helpful…."

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6.6 Crisis or emergency

The situation can include natural disasters such as earthquake and typhoon, disease outbreaks such as SARS and H1N1, or national security such as terrorism and information security. The purpose of interagency information sharing in the situation is to have government agencies stay prompt and to be able to obtain necessary information to immediately react to crisis or emergency. The information flow in the situation can move quickly among agencies, and its priority can override the concern of information privacy and confidentiality. The interviewees stated:

> *A section chief of a central government agency:* "…The activation of emergency mechanism is another type of cross-boundary information sharing. Usually the information sharing among government agencies is very fast in the situation…."
>
> *A deputy director of a central government agency:* "…There is an emergency information sharing system existing in the Department of Health for the immediate reaction to disease outbreak such as H1N1. The system is designed for prompt information sharing among the related central and local government agencies. There is an established standard operation procedure to follow…."

6.7 The identified seven purposes

In the case study, the observed purposes of cross-boundary information sharing are defined and abstracted according to their characteristics and functionalities. There are total seven purposes identified and discussed. The seven purposes are administrative work, information search and verification, information aggregation,

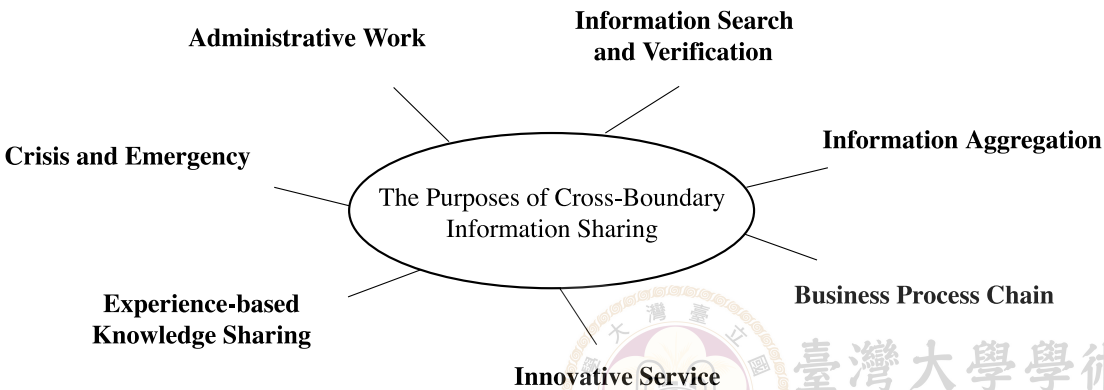


Figure 3. The Proposed Seven Purposes of Cross-Boundary Information Sharing

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business process chain, innovative service, experience-based knowledge sharing, and crisis and emergency (see Figure 3). The identified seven purposes do not represent an exhaustive list but provide an initial conceptualization to perceive the functionalities and roles that cross-boundary information sharing plays among government agencies. In this case study, except administrative work, the major purposes of cross-boundary information sharing are information search and verification, information aggregation, and business process chain. The three purposes are to facilitate government agencies efficiently run respective core business and their connected business processes. Nevertheless, the purpose of innovative service should be promoted because innovative service is not just to increase the "efficiency" of the current business and processes of agencies but to create "new values" of cross-boundary information sharing among agencies.

7. Conclusion

In this research, the types and characteristics of shared information and the purposes of cross-boundary information sharing are investigated and discussed. Five types of cross-boundary shared information were found in the case study: 1) collected raw data, 2) value-added information, 3) administration-oriented information, 4) administration-oriented knowledge, and 5) domain-oriented knowledge. This identification further extends the concepts of integrated data and shared information, the two core components of the conceptualization of cross-boundary information sharing and integration in the e-Government literature. Government agencies can encounter different influential factors and circumstances while sharing or requesting different types of shared information. Administration-oriented information and administration-oriented knowledge were found to be more easily shared or acquired than collected raw data and value-added information because the latter two usually have characteristics related to privacy and confidentiality. However, collected raw data and value-added information represent the majority of cross-boundary shared information in the case. Similarly, domain-oriented knowledge is difficult to be shared or acquired across boundaries because it can be related to security concerns and is often in implicit and tacit form. Government agencies also face limited needs to share domain knowledge to other agencies in different policy areas.

Drawing on the five types of shared information, the study also provides new understanding of the purposes of cross-boundary information sharing and integration. The seven purposes which emerged from the case are administrative work, information

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search and verification, information aggregation, business process chain, innovative service, experience-based knowledge sharing, and crisis and emergency. The seven purposes provide more detailed understanding of the reasons why government agencies engage in cross-boundary information sharing and integration. In each identified purpose of cross-boundary information sharing, different types of shared information can be involved. The complexities of different initiatives of cross-boundary information sharing vary in terms of respective purposes of information sharing and types of shared information. The proposed seven purposes do not mean to be an exhaustive list but to provide an initial conceptualization to perceive the functionalities and roles that cross-boundary information sharing plays among agencies. For practitioners, the purpose of innovative service should be promoted and further exploited. Agencies should be encouraged to share information to other agencies to facilitate the creation of new public value. As identified in the case, the majority of the purposes of interagency information sharing such as information search and verification are to make the current governmental operations work in a more efficient way. Nevertheless, cross-boundary information sharing among government agencies indeed has the potential to allow agencies to provide innovative services to the public.

In the research, although the interview data are gathered from diverse organizations in different social settings to achieve multiple sources of evidence and to increase external validity, the proposed frameworks are still conceptualized and developed under a single case study in qualitative approach. Future research can employ other case studies for further investigation. While data and information as an artifact is the focus of the research, future research can focus on the other types of shared information such as the administrative-oriented knowledge and the domain-oriented knowledge. Knowledge as an artifact in cross-boundary information sharing can be investigated to provide new insights and be compared with the result of this research. In addition, future research can explore and discuss what types of cross-boundary shared information are shared in the respective purposes of interagency information sharing. As aforementioned, the cross-boundary shared information can be classified as data, information, and knowledge. Each type of shared information has its own characteristics to influence respective processes of interagency information sharing. Similarly, different purposes of cross-boundary information sharing have various priorities while some may receive support from authority and legislation and some may not. Therefore, the influential factors in

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sharing different types of cross-boundary shared information in different purposes can also be further explored and compared.

Cross-boundary information sharing has been an important theme among governmental collaboration. The proposed conceptualizations of the research can help both researchers and practitioners to perceive and clarify the fundamental part of cross-boundary information sharing. The outcome of this exploratory research in government information activities is also expected to enrich the current theories of cross-boundary information sharing, to contribute to the current e-Government literature from an international perspective, and to enhance the public administration without borders.

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Note

Note 1 Established in 1969, the Research, Development and Evaluation Commission, a cabinet-level agency of the government of Taiwan, serves as an organization for policy coordination and integration for the Executive Yuan (the Cabinet). The main responsibility of the RDEC is to conduct policy research and development, policy planning, policy supervision and evaluation, government's IT management, circulation of government publications, archives and other tasks assigned to the prime minister. The web site of the RDEC: http://www.rdec.gov.tw/mp110.htm

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跨機關資訊分享的資訊類別與目的之探索研究：以臺灣電子化政府為例

What to Share and Why to Share? A Case Study of Cross-Boundary Information Sharing in Taiwan e-Government

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Tung-Mou Yang[1], Yi-Jung Wu[2]

摘　要

在公部門之間，跨機關資訊分享行為在機關的合作上扮演一重要角色，有助於機關增進其業務運作的效率與效能。此研究旨在探索跨機關資訊分享的過程中，所分享的資訊類別與分享目的為何。研究發現，跨機關資訊分享的資訊可以區分為五種類別，分別為搜集之原始數據資料、已加值處理資訊、行政作業相關資訊、行政作業相關知識與專業領域相關知識。此外，此研究也針對跨機關資訊分享的目的進行概念化分類，並初步將其分成七個目的探討，在此個案研究中，是以資訊的搜尋和驗證、資訊的整合與業務流程鏈為主要目的。此探索研究希望藉著對於跨機關資訊分享在政府機關之間所扮演角色的瞭解，豐富現今電子化政府與資訊分享的相關文獻。

關鍵字：跨機關、資訊分享、電子化政府、台灣

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