

Facilitating G2G Adoption – An empirical study

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Abstract

Considering G2G adoption as one of top priorities in the national agenda which accounts for greater transparency, efficiency and accountability, governments over the world have been implemented G2G initiatives at various levels of administration. However, despite of it's beneficial for government management operations, G2G adoption remains a challenge for governments worldwide. Under many researchers' perspectives, G2G adoption is a complex process requires the involvement of various organizations, each of them has a unique structure, functionalities, culture, goals knowledge and business process. In addition, G2G adoption includes both technical and non-technical aspects, of which various effects from social and organization factors may affect the outcome. In order to successfully establish government to government collaboration, an understanding of various factors influencing G2G development is critical. By employing TOE model, this paper proposes an econometric model aiming to provide a comprehensive investigation on prerequisites of G2G adoption at global level. The outcome strongly supported for all 3 hypotheses which indicates that ICT infrastructure, government IT leadership and e-government promotion activities have influences to the level of G2G adoption.

Keyword: G2G, TOE, collaboration, integration

1. Introduction

The ongoing demands of citizens and businesses about better quality service delivery and the increasing trend of complex issues such as anti-terrorism, disaster recovery, health care and other illegal activities in recent years has put massive pressure on public sectors over the world to modify their structure and business process in order to working together efficiently. (1) has argued that in order to reach higher levels of online services, it is required to change the way governments are operating: it is necessary to have significant cooperation and communication among government agencies. The term of G2G (abbreviated for government-to-government), as its name suggested, commonly refers to “the digitally-enabled collaboration and cooperation perspective among different government agencies” (2); or “activities carried out by government for enhancing the internal management process of government agencies” (3). This acronym reflects the government efforts in strategy planning, information system integration, business reengineering, and cross-section cooperation. Figure 1 demonstrated several examples of G2G applications.

Considering G2G adoption as one of top priorities in the national agenda which accounts for greater transparency, efficiency and accountability, governments over the world have been implemented G2G initiatives at various levels of administration. Australian government has adapted the established and proven Federal Enterprise Architecture Framework (FEAF) developed by the United States Government for developing Australian Government Architecture (AGA) which aims to provide a common language across agencies as well as to identify reusable and shareable services (4). In addition, a National Standards Framework was put in place to deal with the need of

common standards for cross-agency interaction (5). The On-nara BPS is a new business process management system implemented within Korean government organizations that has improved the efficiency and transparency of administration process by handling, recording and managing in a standardized way all the business procedures of the government online.

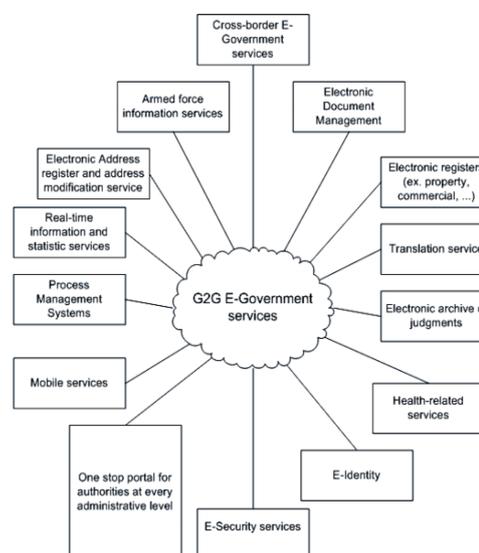


Figure 1. Example of G2G E-Government services (6)

Furthermore, since 2008, Korean government has implemented the Government-wide Enterprise Architecture (GEA) to deal with difficulties in service sharing and management integration among government agencies.

Despite of it's beneficial for government management operations, G2G adoption remains a challenge for

governments worldwide. Since G2G describes the collaboration process among multiple government agencies, it requires the involvement of various organizations, each of them have a unique structure, functionalities, culture, goals knowledge and business process (7). Under many researchers' perspectives, G2G adoption is a complex process with many stakeholders (7) (8), of which various effects from non-technical aspects such as social and organization rather than technical factors may affect the outcome (9). A study conducted by (10) on information sharing claimed that government agencies are concerned about the risk of data misinterpretation among agencies. In addition, they worried about data publicity will helps to improve transparency but also increase the possibility of receiving criticism from citizens and businesses. The existence of incompatible platforms, changing in working process and organizational culture, fragmented and unrelated data structure are several among numerous challenges that every government organization has to face with in order to implement G2G services. In order to successfully establish government to government collaboration, an understanding of various factors influencing G2G development is critical.

Being motivated by above discussion, the objective of this paper is to understand about determinants affecting G2G adoption in different countries. The rests of this paper are organized as follow: the next section is a review about previous relevance studies; then the research continues with research development section which consists of theoretical background, hypotheses and methodology. Data analysis, discussion, and future research suggestions will be represented in the last section.

2. Literature review

A set of different determinants of G2G adoption have been evaluated in past researches and case studies. Regarding to information sharing issues among government agencies, numerous of studies have been conducted in selected countries and regionals. (11) employed a layer behavioral model to examine different challenges of G2G information sharing in China government. Through an empirical method, the study found that high-level leadership, compatibility, top-management support, cost, security, expected risks and benefits and GuanXi – the term describes commitment, loyalty and long-term mutual benefits (11) – have significant influence to G2G information sharing. By examining Iranian G2G context requirements, (12) proposed a set of heuristic principles affecting government system which was categorized into 4 domains: infrastructure, content and applications, management and security. The study of (9) focusing on the adoption of electronic information sharing (EIS) among UK local government authorities attempted to present a conceptual framework which consists of 5 layers namely environment, technology, organizational, business process and barrier/benefit/risk (BBR). Each layer has a collection of factors affecting to EIS, but the priority level of each factors differs from organization to organization. The research also provided a

summary of lessons learnt from case studies which emphasized the role of Central Government, the necessity of a strong leadership, the need for infrastructure re-engineering and the need for professionalism in information management. Another G2G case study was demonstrated in the research of (13) by examining the context of Taiwan e-government. The authors aimed to explore boundaries of cross-boundary information sharing and integration based on an integrated framework of boundaries adopting from the literature. They argued that the presence of a centralized information system the scenario of Taiwan could help to cross or remove restrictions among government agencies. In addition, the study also verified that vertical boundaries are not always easier to cross than horizontal boundaries. A comparison from two case studies conducted in (2)'s research listed some fundamental parameters to the success or failure of G2G enterprises. Those finding factors comprised of security, organizational culture and personnel training which enabled the authors to indicate common obstacles as well as the causes and possible solutions, all together resulted in a so-called heuristic model for implementation in G2G projects.

There is a substantial body of literature about the adoption of G2G information systems; however most of studies focus on specific case studies in a country, therefore the outcome conceptual models drawn from previous researches were affected by individual characteristics of that country such as national culture or political structure, then thus could not be widely used in other scenarios. This limitation came from the lack of national-scope empirical data which might be applicable of covering global issues. In order to fill in this gap, this paper aims to provide a more generalized outlook at prerequisites of G2G adoption at global level.

3. Research development

3.1 Theoretical background

The research is grounded on technology–organization–environment (TOE) framework with the intention of identifying various factors affect to G2G development process. The model was introduced in Tornatzky and Fleischer's book namely "The Processes of Technological Innovation" in 1990 which demonstrates how different elements have influences to a firm's decision of technological innovation adoption. According to authors, those elements can be categorized into 3 broad contexts: technological, organizational and environmental. In general, these three groups demonstrate "both constraints and opportunities for technological innovation" (14). Figure 2 represents the conceptual model of TOE framework.

A few studies have been found examining on how TOE elements affect to the technological adoption process at national scope. A country can be seen as an organization of which its technological implementation level is achieved under the impacts of that country's economic status, ICT infrastructure, human capitals, institutional, national policy

and others factors which can be similarly found within firm context. Hence, this research will be extended to the national level which aims to provide a comprehensive investigation about how G2G services are adopting in a country.

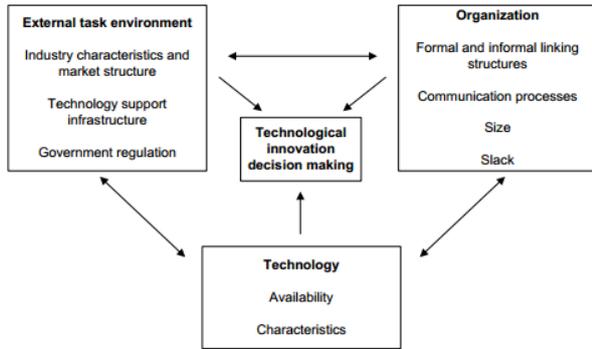


Figure 2: TOE framework (14)

3.2 Hypotheses

Different factors influencing the adoption of G2G at national level will be examined through three domains of TOE model as below:

3.2.1 Technological domain

The technological context refers to technologies relevant to firm which is currently adopting by firm (internal) or is available on the industry (external) (14). When applying for national scope, this factor identifies the country's underlying ICT infrastructure that is ready for G2G initiatives implementation. With respect to inter-agency integration, different organizations have dissimilar types of hardware, software and information system, thus developing inter-agency integration and sharing is a complicated task (9). The findings of (15)'s research about 19 interoperation and integration projects in government has claimed that the heterogeneity of technological landscape among agencies presented a major constraint to the success of interoperability projects. (2) confirmed that an adequate infrastructure which includes not only information system implemented within an agency but also the secure digital link between agencies is one of the major resources needed for developing G2G projects. It is obvious that participating in G2G process requires a certain level of IT infrastructure. Therefore, the first hypothesis therefore is proposed:

H1: ICT infrastructure is positively related to G2G adoption.

3.2.2 Organizational domain

The organizational context is defined in term of firm's characteristics and resources including managerial structure, firm size, internal communication process, human capitals and the amount of slack resources (14). Among organizational factors, many authors have believed that leadership could be considered as a major driving force to promote cross-borders collaboration between organizations (16), (9). The presence of powerful chief information

officers at all levels of government is believed to be able to define rules and standards for collaboration and information sharing. In addition, a powerful leadership could help to "build agreement, promote trust among participating agencies and clarify roles and responsibilities during the project process" (8). Due to the fact that the chief information officers responsibilities are no longer restricted around technical facets but are extended to handle more complicated responsibilities such as policy planning, budget management, ICT investment...government CIO has been considering as a critical factor for the success of any G2G project (3). Drawing upon above discussions, this study hypothesizes:

H2: Government CIO has a positive influence to the success of G2G adoption.

3.2.3 Environmental domain

The environmental describes the environment in which firms business is operated: industry characteristics, regulatory environment, competitors, relationship with governments, and so on (14). Among those environmental elements, the e-government promotion activities and mechanisms appeared to be the most referred issue by former researchers. According to (3), e-government promotion refers to the degree of government supporting for e-government initiatives which includes legal frameworks, (law, legislations, plans, policies and strategies) and mechanism (funding, oversee organizations, outcome evaluation). In term of G2G adoption, there is a need of legal framework layer which defines the scope, content and standards of collaboration and integration among government agencies (9). Moreover, the types of data and the circumstances in which data could be shared with other agencies should be declared explicitly by formal regulation documents. Furthermore, the presence of a legislation document may become a useful tool in compulsory enforcement of G2G usage in practical. These evidences lead to the last hypothesis:

H3: Government promotion activities positively impacts to the success rate of G2G adoption.

The conceptual model representing factors affecting to G2G adoption is shown as in Figure 3.

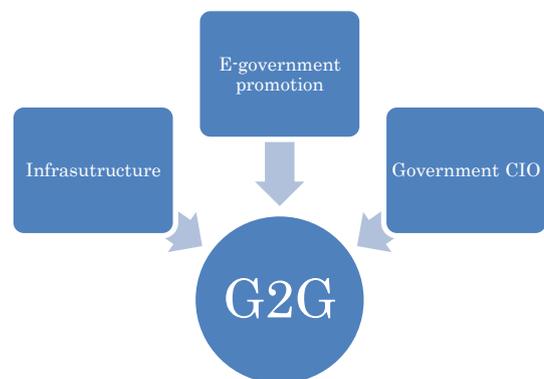


Figure 3: Determinants model for G2G adoption

4. Methodology and data analysis

4.1 Methodology

For validating above hypotheses, this study utilizes secondary data sources from World Economic Forum's Global Information Technology Report and IAC-Waseda E-government Ranking. To maintain a strongly balanced panel data, 38 countries appearing in both reports during the period 2011-2014 were selected. To maintain the consistency of data through years and avoiding the effect of measurement error, three indicators of IAC-Waseda survey are re-calculated based on percentage scale.

4.2 Constructs and measures

As shown in the conceptual model (Figure 3), there are four constructs in this research: G2G adoption level, ICT infrastructure, government CIO and ICT legal environment.

- G2G adoption is taken from IAC-Waseda E-government Ranking's optimization management indicator. This index is measured by taking into consideration three components namely: optimization awareness - assessing the presence, scope, timeliness and targets of the national e-government strategy; enterprise architecture - measuring the existence of national government centralized network, enterprise architecture system, interoperability framework and national metadata standards; administrative and budgetary systems – qualifying the appearance of a centralized or shared administrative system such as electronic financial management information system (FMIS), budgetary system, human resource management system, or a document management system.

- ICT infrastructure was constructed based on the Infrastructure and Digital Content pillar of WPF's Network Readiness Index. This indicator "captures the development of ICT infrastructure (including the mobile network coverage, international Internet bandwidth, secure Internet servers, and electricity production) as well as the availability of digital content" (17).

- Government CIO is another construct delivered from IAC-Waseda E-government Ranking survey. In a country scenario, the level of government CIO is measured not only by the presence of a CIO in different levels of government but also by the existence of legislations, regulations and policies which were promulgated in order to explicitly mandate and identify the role of CIO (3). This index is evaluated based on GCIO presence – whether or not a CIO is appointed at national and local government; GCIO mandate – is there any law or regulation enacted to identify the role and responsibility of CIO position; CIO organization – is there any CIO association in the country; and CIO development programs – is there any CIO training program, CIO course and CIO institution available in the country.

- E-government promotion is a pillar directly taken from the IAC-Waseda E-government Rankings. This

indicator reflects "activities involved in supporting the implementation of e-Government such as legal frameworks and mechanisms" (3).

4.3 Data analysis

To analyze the data, the author employed fixed-effects estimator. The underlying econometric model is constructed as following:

$$g2g_{it} = \beta_1 + \beta_2 * ictinfr_{it} + \beta_3 * promo_{it} + \beta_4 * gcio_{it} + u_i + e_{it}$$

In which:

$g2g_{it}$: The optimization management score of country i at time t .

$ictinfr_{it}$: The basic ICT infrastructure development score of country i at time t .

$promo_{it}$: The e-government promotion of country i at time t .

$gcio_{it}$: The Government CIO score of country i at time t .

u_i : The random-effects error.

e_{it} : The random error.

The analysis result is reported in Table 1. The outcome strongly supported for all 3 hypotheses which indicates that ICT infrastructure, government IT leadership and e-government promotion activities have influences to the level of G2G adoption. This result is consistent with previous studies in this area.

5. Conclusion

By constructing an econometric model, this study aims to contribute an understanding about fundamental factors which are prerequisites for a collaborative environment inside government. Instead of exploring a full list of factors which may have influence to G2G adoption, the study found 3 critical elements which are necessary for implement successfully G2G projects. Using fixed-effects estimator eliminates several potential factors which represent heterogeneity between countries such as social culture, political pressure, public sector structure, and so on. Those factors are worth considered in policy making progress, therefore they will need a more comprehensive method for data analyzing to discover broader. In addition, although using secondary data sources gives opportunities to examine the issues in a global level, the consequence of this choice is the author could not include several countries which are missing in one of data source using in this study.

Table 1: The analysis result using fixed-effects estimator

g2g	Coeff.	Std. Err.	t	P> t 	[95% Conf. Interval]	
promo	.1873604	.0936327	2.00	0.048**	.0018209	.3728999
gcio	.3633817	.1134958	3.20	0.002*	.1384821	.5882813
ictinfr	1.045087	.3208645	3.26	0.001*	.4092723	1.680901
_cons	-19.15943	23.67684	-0.81	0.420	-66.07667	27.7578
sigma_u	19.95206					
sigma_e	11.453826					
rho	.7521323					

*, **, and *** indicates significant level of 1%, 5%, and 10% respectively

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