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Abstract

To make the government smart has become a crucial issue for sustaining worldwide, competitive advantage. Smart government refers to utilize information and communications technologies (ICT) to improve the national development and the quality of people living. Many developed countries have implemented e-invoice to improve business environment, taxation process, and public service. The Uniform Invoice, with five formats, was originally designed to enhance the taxation mechanism in Taiwan. To improve the administrative efficiency of transaction process and taxation, the e-invoice platform had been developed in the past decade. The focus of this study is to understand the impediments and proposed solutions during the e-invoice implementation and promotion. In this case study, we summarized the e-invoice evolution process into three phases: (1) the paperless phase, (2) the diffusion phase, and (3) the cloud-enabled phase. The coevolutionary adaptation process was drawn as our analytical framework. The findings can provide preliminary understanding of how an integrated e-invoice platform can enable the development of smart government.

Keywords: E-invoice, case study, IT adoption, cloud computing.

1 INTRODUCTION

Smart government refers to apply and integrate information and communications technologies (ICT) as well as public facilities for generating sustainable public value (Howard & Maio 2013). The government gradually utilizes ICT to improve the national development as well as the quality of people living (Bughin et al. 2010). The e-government can foster the needed foundation and collaborative environment for developing smart cities (Paskaleva 2009; Yang et al. 2012). According to an investigation, there are 143 undergoing smart city projects around the world (Lee 2012). The prevalent adoption of mobile devices, cloud computing, and Internet of Things enables government to increase responsiveness as well as to decrease manage costs by the confluence of commoditization and socialization.

E-invoice can enable both firms and government to reduce the management costs of issuing, distributing, and keeping invoices. In order to streamline transaction procedure, many countries, especially in Denmark, Sweden, and Finnish, have implemented e-invoice (Chang et al. 2012; Partland & Afriyie 2013). Based on the development of electronic commerce in Taiwan, firms gradually exchange the transaction information through the Internet. In 2000, the Taiwan's Ministry of Finance (MOF) conducted a proof of concepts (POC) of B2B e-invoice. Then, in 2004, MOF proposed an e-invoice initiation project which plan to reduce the usage of paper-based invoice. In the past decade, the e-invoice platform has been developed to enhance the e-invoicing of B2G, B2B, and B2C. After two generation evolution, now the platform has processed nearly 1.9 billion invoices from more than 30,000 companies, including 105 distributors (Lee & Wang 2013; MOF 2014).

The implementation of e-invoice can be regarded as a paragon shift of business transaction, which will accompany with business process reengineering. How does an e-invoice platform be established and implemented to enhance the transaction processes and to enable the development of smart government? By using ethnographic research, this study focuses on the evolution process of the e-invoice implementation in Taiwan through the perspectives of the government and key organizations. The contributions of this work are: (1) to elaborate the progress of e-invoice policies, (2) to understand the evolution of e-invoice platform, and (3) to discuss the strategy shift of e-invoice diffusion.

This paper is organized as follows. In the next section, we present the theoretical background and review the development of e-invoice. The participant observation-based case study research procedure is described in the third section. Then, the progress of e-invoice policies, the evolution of e-invoice platform, and the strategic shift are presented in the fourth section. In the discussion and conclusions section, the implications for academy and management will be discussed.

2   RESEARCH BACKGROUND

2.1   E-invoice for smart government

E-government is an IT-enabled improvement of government administration (Layne & Lee 2001). Recently, the IT-enabled smart sustainable development, such as smart city and smart government, has drawn much attention for policymakers, researchers, and practitioners (Chourabi et al. 2012; Giffinger & Gudrun 2010; Lee et al. 2013; Nam & Pardo 2011). According to Gartner's definition, smart government refers to an administration which utilizes the integration of ICT for planning, managing, and operating within a single tier (city, state, or federal) or across tiers (across state and local governments) to generate sustainable public value (Howard & Maio 2013). Smart government can be viewed as the highest level (i.e. integration) of e-government project (Al-Hashmi & Darem 2008). With more transparent and collaborative information sharing, smart government provides sustainable, integrated, and cross-boundary public services (Bughin et al. 2010; Goon 2013).

The governments around the world have implemented e-invoice to enhance the business transactions. According to Billientis' investigation, the worldwide annual volume of e-invoices is estimated around 350 billion (200 billion for consumer, 150 billion for business and government) and the growth rate is 20% (Koch 2012). In 2001, the governments in Europe gradually make regulations to enable the electronic-based taxation and commercial activities, others in Aisa and Latin America also introduce similar efforts since then (Keifer 2011). Europe is the leading area of e-invoice development (Korkman et al. 2010). Realization of e-invoicing has potential to reduce transaction cost in corporate and public sector by 200 billion Euros annually (Nienhuis & Bryant 2010). For instance, the e-invoice in Denmark is put into force in February 2005, around 90% of invoices to public sectors are in electronic form in nowadays (Danish Ministry of Finance 2005).

The main benefits of using e-invoice including digital information capture, automated validation, vendor self-service, enhanced account reconciliation, and enhanced spend management (Keifer 2011). There are three key areas of e-invoice: (1) B2B (business to business): the B2B e-invoice adoption is driven by leading companies in the supply chain. The main purpose is to integrate and smooth the processes of procurement, shipment, payment, and accounting;(2) B2G (business to government): it focuses on improving the efficiency between public authorities and companies;(3) B2C (business to consumer): it focuses on providing e-invoice to consumers and enables possible applications for banking, financial management, and lifestyle improvement. To enable the implementation of e-invoice, the challenges include making regulations, the fragmentation of buyer and service provider, pricing dynamics, interoperability, reverse invoicing and self-billing, and category-specific considerations (Danish Ministry of Finance 2005; Keifer 2011).

2.2   The coevolutionary adaptation process

Organizations need to develop their dynamic capabilities to response the fast-paced competitive environments (Barreto 2010; Prahalad & Hamel 1990; Sambamurthy et al. 2003). To maintain the sustainability, organizations need to adapt and to transform to cope with the technical, legal, and environmental challenges. Form the organizational ecology perspective, only the organization which can strategically adapt to the development and competition can survive (Tushman & O'Reilly III 1996). Organization transformation refers to the organization changes made for sustaining in competitive environment (Lavy & Merry 1988). Managers should penetrate "the strategic dissonance" between organizational strategy and the environment and make appropriate strategic actions (Burgelmen & Grove 1996). The purposes of organization transformation include improving operations, strategic transformation, and self-renewal (Blumenthal & Haspeslagh, 1994).

According to the resource-based view, organization, which is regarded as a combination of various resources, can maintain the competitive advantage through developing or accessing better resources and capabilities (Barney 1991). Teece et al. (1997) proposed the concept of dynamic capabilities which refer to "the firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments." ICT provides needed capacities for organizations to response to the change and uncertainty (Sambamurthy et al. 2003; Venkatraman 1994). Venkatranman (1994) discriminated the transformation between evolutionary and revolutionary and proposed five different level of IT-enabled organization transformation, including localized exploitation, internal integration, business process redesign, business network redesign, and business scope redefinition. The government also utilize ICT to improve and redesign the delivery of government administrations and public service (Gil-Garcia et al. 2007; Yang et al. 2012).

Sambamurthy et al. (2003) proposed a theoretical model to describe how IT investments and dynamic capabilities influence the firm performance. They advocated three important dynamic capabilities (i.e., agility, digital options, and entrepreneurial alertness) and three IT-enabled strategic processes (i.e., capability-building, entrepreneurial action, and coevolutionary adaptation). Coevolution is a strategic process which refers to the "flexibility in the line-up of assets, capabilities, and knowledge that a firm can assemble in order to detect the windows of opportunity in the marketplace and capture positions of advantage (Sambamurthy et al. 2003, p. 241)." Agility is a capability to rapidly assemble the needed assets, knowledge, and relation when the opportunities for innovation are detected (Goldman

et al. 1995). Entrepreneurial alertness refers to a capability of detecting the opportunities, while digital options refer to the utilization of IT in work process and knowledge systems (Sambamurthy et al. 2003). The coevolutionary adaptation refers to a virtuous and recursive learning process triggered by competitive actions which revitalizes the three dynamic capabilities and will further influence the development of IT competence (Sambamurthy et al. 2003). The coevolutionary adaptation process is shown as Figure 1. This study focuses on the evolutional process of e-invoice in Taiwan. Therefore, the coevolutionary adaptation process was drawn as our analytical framework.
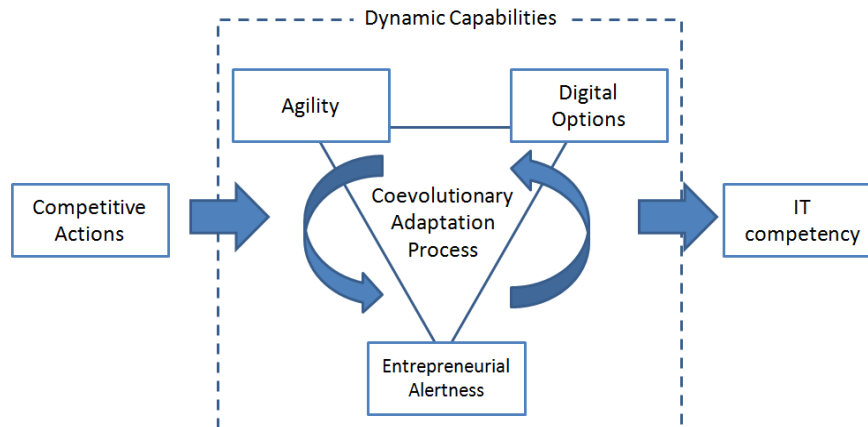

Figure 1.   The coevolutionary adaptation process.

3   RESEARCH METHOD

In this research, a participant observation-based case study method was conducted to investigate the process of the e-invoice development. The research process followed the market-oriented ethnography which puts emphasis on explicating the patterns of focal action through the participation and observation of the researchers (Korkman et al. 2010). The market-oriented ethnographic research process has following four features: (1) data is collected in natural settings; (2) the need of extended, experiential participation of the researchers; (3) the interpretations of action;(4) the incorporation of multiple sources of data (Arnould & Wallendorf 1994).

The multiple source of evidence (i.e., triangulation) was employed to increase the validity and reliability (Yin 2003). The case study was developed by using the research techniques suggested by Korkman et al. (2010). First, a set of reports (both published and unpublished) retrieved from the government, research institution, and firms who participated the development of e-invoice platform was analyzed. Second, data was collected through semi-structured interviews and workshops participation. A purposive sampling was adopted to select relevant interviewees (Wengraf 2001). Finally, one of the authors is the vice president of the firm engaged in the construction and maintenance first generation e-invoice platform in Taiwan. The other two authors serve as officers of Cloud Project Office which is in charge of giving suggestion to the e-invoice platform. Therefore, informal conversations, discussions, and meetings also added to the quality of data collected. The triangulation of these multiple source of information was carried out through the discussion among there authors. These techniques allowed the researchers to build a complete picture of the e-invoice evolution process.

4 CASE DESCRIPTION AND ANALYSIS

4.1 The progress of e-invoice policies

The Taiwan's MOF had created a special taxation tool - the Uniform Invoice, which is a paper-based invoice with five formats and has been in use for almost 60 years. Traditional paper invoice has be used as an important certificate of business transaction, accounting, internal and external auditing, and taxation. Business entities are required to issue Uniform Invoice to the buyers as the proof of receipt which further will be used for filing tax. According to the statics of MOF, the annual volume of paper-based Uniform Invoice is about 8 billion, including 4% for B2B and 96% for B2C. A lottery mechanism is developed for encouraging consumers to take B2C invoices. With the flourish of e-business, the Cabinet approved "the project of knowledge-based economical development" in 2000 and started to push the e-invoice to eliminate obstacles and reduce costs of business transaction.

MOF initiated "the e-invoice development project" in 2004 and "the overall promotion of e-invoice applications project" was proposed to extend the extent of adoption of e-invoice in 2010. An e-invoice platform owned by MOF (http://www.einvoice.nat.gov.tw) is established to providing service including invoice certification, tax service, data exchange and statistic analysis. The projects are outsourced to two major teams (i.e., the planning team and the deployment team) with four key organizations (see Figure 2). The planning team was responsible for investigation, standard making, suggestions for regulations, and the planning, verification, and validation of the e-invoice platform. The Institution of Information Industry (III) and PwC were respectively in charge of planning the first and the second generation e-invoice platform. The deployment team was responsible for development, maintenance, and promotion of the e-invoice platform. The first generation platform was establish by MiTAC Co., while Trade-Van was responsible to develop the second generation platform.

In order to establish an enable environment for developing e-invoice, MOF has gradually made regulations (see Figure 2). In November 2000, the regulations for transmitting Uniform Invoice over Internet have been published for firms to exchange the transaction information through the Internet. In the meantime, MOF also conducted a POC of B2B e-invoice. With the proliferation of B2C e-commerce, MOF published the regulations for issuing online shopping invoice in 2005. "The e-invoice operation guidelines" has been published in 2006. The regulations have experienced several times of update, including loosening the limitations toward business entities and value-added service providers, comprising TV and catalog shopping, and excluding the performance bond. The legislation provides foundation for e-invoice promotion.

The Cabinet approved "the cloud computing industry development project" which included the e-invoice as one of the priorities toward cloud-based public service. In 2011, all entities using e-invoices were required to exchange information with the e-invoice platform owned by MOF. For integration of multichannel transactions, including virtual and physical channel, "the operational guidelines for issuing e-invoice in physical channel" has been proposed in 2012. To increase the adoption of B2C e-invoice by general consumers, the mobile phone number, which is transformed into a two-dimensional bar code, is employed as a device for integrating all e-invoices received by different smart card carriers. The LoveCode is promoted to encourage consumers to donate their e-invoices to social welfare institutions. MOF further regulated a uniform receipt of B2C e-invoice in 2014 and gradually to eliminate the usage of paper-based invoice.

The e-invoice policies can be categorized into three phases: (1) the paperless phase puts emphases on making regulations for transforming paper-based invoices into electronic format; (2) the purposes in the diffusion phase are to extend the possible participants and to include B2C and B2G utilization; (3) in the cloud-enabled phase, the regulations were made to stimulate the development of various e-invoice applications as well as to extend the adoption. In the end of 2013, the platform has processed nearly 1.84 billion e-invoice from more than 52,882 companies with more than 30 clients as members of providing value added service. Figure 2 presents the e-invoice evolution process in Taiwan.
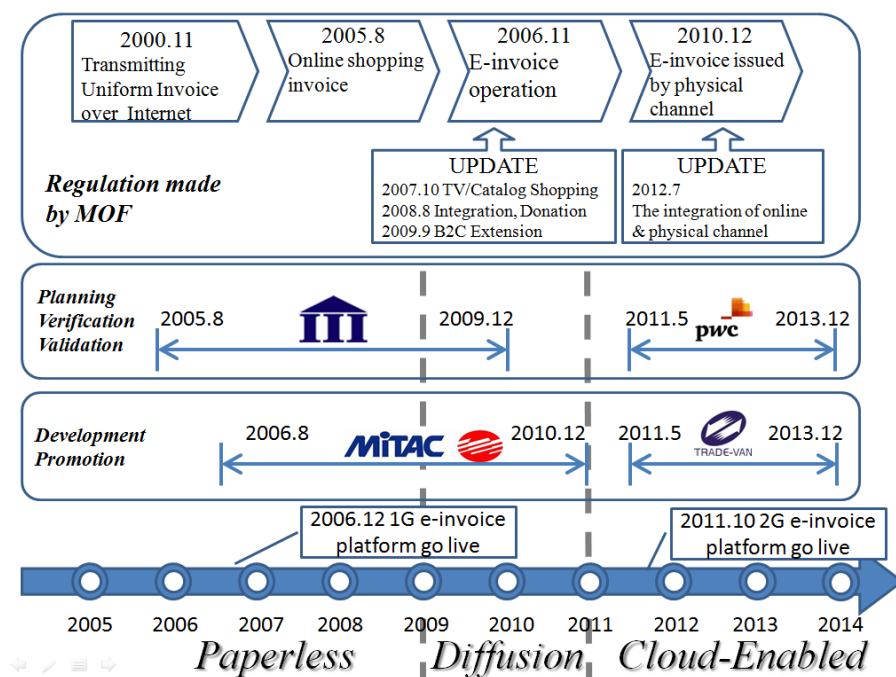
Figure 2. *The e-invoice evolution process in Taiwan.*

4.2 E-invoice platform evolution process

The e-invoice platform has unfolded with two generations. After conducting the preliminary investigation of e-invoice development, the III proposed an e-invoice integrated platform development plan with following characteristics: (1) the platform provides data exchange among various value-added companies and constructs the e-invoice transmission environment; (2) the related standard and regulations should be made to reduce the implementation duration and cost ; (3) to conduct promotion and training programs to speed up the scale of adoption; (4) the integration between different service platforms and systems; (5) to set up a group or organization to responsible the sustainability of the e-invoice platform. After the public appraisal, the MiTAC was responsible for the deployment, maintenance, and promotion of the first generation e-invoice platform. The III played the role as IV&V (independent verification and validation) to resolve problems and obstacles in the e-invoice implementation.

The first generation went live at December 2006. The first generation e-invoice platform provides service for general users (consumers), tax specialists, business entities, EC business entities, and value-added firms. The functions of this platform include B2B invoice exchange, B2C invoice upload, account management, invoice management, and auditing. To enhance business transactions, the ERP systems of business entities can be integrated with the platform. The official website provides a single entrance for different participants. The MiTAC provides supports for MOF in the following perspectives: (1) the development of the e-invoice integrated platform; (2) the provision of maintenance services; (3) the promotion of e-invoice adoption; (4) the deployment of the platform and related application; (5) the extension of taxation management system and the integration of related government information systems.

The PwC consulting firm was responsible for planning the second generation e-invoice platform. After reviewing the status quo of adoption, the PwC proposes the following problems: (1) the original platform can not handle the increasing volume of e-invoice; (2) the integration with taxation management system has room for improvement; (3) the high cost of parallel usage of paper-based and electronic invoice; (4) the benefits of implement are not well perceived by business entities; (5) the confusion of B2C e-invoice operational procedure. Through the public appraisal campaign, the Trade-Van was chosen to responsible for the development and maintenance of the second generation e-

invoice platform. Like the role of III played in the first generation, the PwC is the IV&V during the second e-invoice generation development. In order to extend the adoption scale, this generation integrate B2C e-invoices form virtual and physical channels, B2B e-invoice form value-added service providers, and B2G e-invoices. The data was migrated to new system infrastructure while maintain the integration with taxation management system and other related government systems.

Base on the previous version, the second generation was extended by adding new functions, multiple interfaces, and different actors. The second generation went live at November 2011. The platform enables consumers to get and manage the e-invoice and also automatically provides lottery results. The business entities can use the platform to return, draw up, debit, and perform other e-invoice operation. Companies also can employ the platform to exchange e-invoices with public agencies. The second generation e-invoice platform has following features: (1) the update version of official web portal; (2) the supporting service; (3) the common e-invoice functions; (4) the value-added applications; (5) the integration service. The second generation e-invoice integrated with various interfaces, such as POS, KIOSK, and mobile device. The participant actors also extended by including official auditor, welfare institutions, financial institutions, and public agencies. The evolution of the architecture of e-invoice platform is shown in Figure 3.
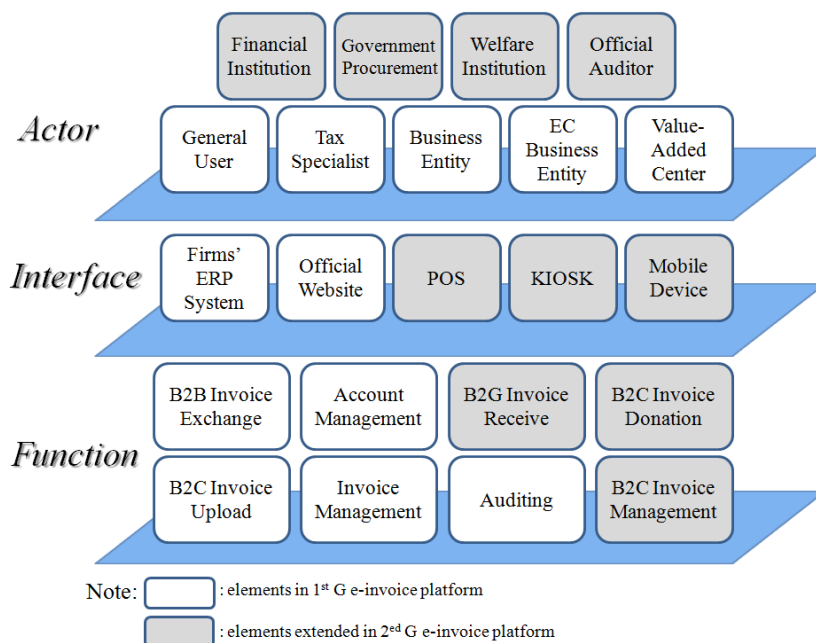

Figure 3.   The architecture of e-invoice platform in Taiwan.

	Paperless (2005~2008)	Diffusion (2009~2010)	Cloud-Enabled (2011~2013)
Strategic Target(s)	● B2B & B2C	● B2B, B2G, & B2C	● B2B & B2C
Impediments	● Lacking legal and operational environment for electronic accounting and taxation processes	● The low adoption in the supply chain with parallel usage of paper-based and electronic invoice ● The public agencies do not have operational regulations and auditing procedures of e-invoice ● The limitations on performance bond and transaction type in B2C e-invoice.	● The various e-invoice formats exist in different value-added service providers ● Previous B2C promotion only focuses on business entities of cyberspace
Competitive Actions	● Initiation of e-invoice platform development and promotion ● Legislation for using e-invoice	● Legislation for extend the possible adopters ● To loosen the limitations requirements	● To integrate virtual and physical channels ● To use mobile phone as the B2C e-invoice integrated device
Digital Options	● The e-invoice platform enhances e-invoice exchange	● The platform can provide e-invoice exchange among public agencies, companies, and consumers.	● To enable the innovative and value-added apps development by providing open data and APIs
Agility	● Providing operational agility for participants	● Providing better utilization of e-invoice for partners	● Providing agility to better interaction with consumers for participants
Entrepreneurial Alertness	● To extend the scale of adoption	● Conducting B2C e-invoice POC in physical channel ● Planning for migrating to cloud-based architecture	● Integration with other government cloud-based applications ● Development of big data applications
IT competence	● To develop functions for stimulating various actors to adopt	● To Develop cloud-based platform which can handle the huge volume of B2C e-invoices	● To combine new technologies like IoT, sensor-rich devices for developing next generation platform
Outcomes	● 8,005 business entities ● 42.68 million e-invoices	● 27,027 business entities ● 69.74 million e-invoices	● Received awards form FutureGov and 2011 eASIA Award ● 52,882 business entities ● 3.6 billion e-invoices

Table 1.   *The analysis of e-invoice platform evolution in Taiwan.*

4.3   The strategic shift of e-invoice

The e-invoice has promoted about ten years in Taiwan. In the beginning, MOF focus on the B2B e-invoice implementation. After interviewing with business entities and value-added providers, the III found the following problems should be resolved during the e-invoice promotion: (1) lacking transmission standard and integrated platform; (2) the high costs to establish a value-added center; (3) low intention of adoption among business entities; (4) the limit value-added usage of e-invoice; (5) lacking related regulations for e-invoice.

As mentioned above, MOF gradually published and update the related regulation for constructing the legitimacy for firms to adopt e-invoice. During the diffusion phase, MOF shifted the strategy and put emphases on promoting the adoption of B2C invoice. According to MOF's estimation, the annual volume of e-invoices is about 4 billion. According to the regulations, MOF has responsibility to keep the records at least ten years. In order to afford the huge volume of e-invoices, the second generation e-invoice platform has developed a cloud-based architecture (such as Hadoop, MapReduce, Hbase). Then, the big data analysis techniques will be employed to provide value-added service. Table 1 provides the analysis of the strategic shift and the emphases in each phase.

5   DISCUSSION AND CONCLUSIONS

E-invoice has been implemented by many counties for developing smart governments. The implementation of e-invoice can enhance the business transaction as well as reduce operational costs. In Taiwan, after the ten years promotion, the current e-invoice platform has developed needed functions. In addition, the MOF also made regulations to encourage the participation. However, according to the statistics of MOF in 2014, only 3.6% of the 825,778 business entities, which are regulated to issue Uniform Invoice, have adopted the e-invoice platform. In addition, only 6% of e-invoice are used electronic receipt. The transitional paper-based e-invoice is still used as the receipt. For consumers, the e-invoice only change the way of receiving traditional Uniform Invoice. As to business entities, how to incorporate the e-invoice platform into their existing enterprise systems and business processes is more crucial. Therefore, it still needs more efforts for promoting the adoption of e-invoice.

5.1   Future research directions

In this study, our findings provide preliminary understanding of the policies progress, the evolution of e-invoice platform, and the strategy shift of e-invoice diffusion. This study sheds light on the future works on e-invoice platform development and implementation. First, since Taiwan is the leading country of implementing e-invoice, the following evolution of e-invoice in Taiwan still worthy to keep track on it. Second, as we mentioned above, further researches can try to figure out the low adoption rate of B2B e-invoice. Finally, based on the techniques trends, big data analysis and smart government will be combined for next generation of e-invoice. How does the new e-invoice platform enable a government more smart is needed further works on it.

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