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ATINER's Conference Paper Series

BUS2013-0626

**Investigating the Relationship between
Enterprise Resource Planning (ERP)
System and Internal Control:
A Exploratory Study**

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URL Conference Papers Series: www.atiner.gr/papers.htm

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ISSN 2241-2891

22/10/2013

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This paper should be cited as follows:

Shaiti, H., Duan, Y. and Abdel-kader, M. (2013) "Investigating the Relationship between Enterprise Resource Planning (ERP) System and Internal Control: A Exploratory Study" Athens: ATINER'S Conference Paper Series, No: BUS2013-0626.

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Abstract

This research aims to investigate the effect of ERP systems success in providing adequate effective internal control procedures. In order to explore this relationship, this research has identified three propositions derived from the existing literature. First proposition addresses the relationship between ERP success and the contingency variables (strategy, structure, size, management support, organisational culture, ERP band and the maturity of ERP systems). Second proposition refers to the relationship between the internal control procedures and the seven contingency variables. Last proposition outlines the impact of ERP systems success on internal control procedures.

Preliminary result based on exploratory study find that different companies follow different requirements and that mainly depends on ownership. Eight components of COSO's ERM framework (internal environment, objective setting, event identification, risk assessment, risk responses, control activities, information& communication, and monitoring) are considered in the study, but there are variations regarding their level of involvement. The findings show that ERP systems can reduce the cost, increase the speed of producing results and reports, reduce the errors, and improve internal control procedures. However, the impact of ERP system can be different from one company to another. The study concludes that further quantitative study is required to explain the impact of ERP system success on internal control procedures and to measure the effect of the seven contingency variables.

Keywords: Enterprise Resource Planning system, ERP system success, internal control, Enterprise Risk Management, contingency variables.

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Introduction

Internal control (IC) may be considered as the most important procedure within an organisation. It can prevent and detect any errors and fraud that an organisation may face and also provide a reasonable assurance regarding the organisation's data and resources. However, IC means different things to different groups of people. This may cause perplexity among an organisation's management, regulators, legislators and others. If the term 'internal control' is not clearly defined, this may produce different expectations and miscommunication which might cause problems within an organisation. IC in this research deals with the needs and expectations of the management and other business people.

In 1992, the Committee of Sponsoring Organisations of the Treadway Commission (COSO) developed an IC framework, designed to improve the organisational performance and governance and decrease the extent of fraud in organisations. The COSO internal control framework became recognised by many countries around the world, such as Australia, France and Saudi Arabia, especially after the scandals related to Enron, WorldCom and other companies.

COSO identifies IC as: 'as a process, effected by an entity's board of directors, management and other personnel, designed to provide reasonable assurance regarding the achievement of objectives in the following categories: Effectiveness and efficiency of the organisation's operations, Reliability of the financial information, Compliance with the applicable laws and regulations' ((COSO), 1992).

However, achieving the three IC objectives might raise some issues (Morris, 2011). Concentrating on achieving the IC objectives may affect the achievement of the organisation's goals and cause serious problems. Another issue related to achieving the second and third IC objectives is the existence of IC regulations which require the disclosure of IC data. Although, some countries have adopted an IC regulation, such as the Sarbanes Oxley (SOX) Act (2002) in the USA, others have no clear IC regulations to apply to all firms.

A significant problem associated with achieving the effectiveness and efficiency of an organisation's operations is the interruption of the information flow. Therefore, this research develops two main arguments. The first states that an organisation might need an integrated system, such as an ERP system (Huang et al., 2008). An important factor for a robust IC system is the segregation of duties, which entails tasks or jobs being divided between more than one person in order to prevent fraud or errors occurring. However, the legacy system does not support this function as well as an integrated system does (Turner and Owhoso, 2009). The second argument is related to the existence of COSO's ERM framework's components. Bowling and Rieger (2005) indicated that considering the COSOERM framework would help to assess the efficiency of ICPs and increasing the confidence of the stakeholders and regulators. Therefore, this research seeks to address the question of

whether integrated information technology systems like ERP systems can provide an organisation with effective ICPs.

Section 2 reviews the ERP system and IC related literature; Section 3 explains the theoretical framework; Section 4 identifies the research methodology; Section 5 discusses the results; and Section 6 provides the conclusion.

Literature Review

There have been a few empirical researches on ERP systems and IC. Kumar et al. (2008) investigated the challenges facing an organization in the case of the compliance to their ERP systems with the IC requirements, particularly those imposed by the SOX Act. They found that the companies faced technical, process-related, and cultural barriers when they came to adopt these requirements. Maurizio et al. (2007) indicated the need for fully integrated systems like ERP systems to prevent the interruption of the data flow.

ERP vendors (e.g. SAP, Oracle) have taken advantage of the improvement in IC regulations by updating the system's reports and features. ERP systems can produce control and exception reports which help to improve the monitoring and the segregation of duties (Turner and Owoso, 2009). ERP systems can provide ICPs with tools for gathering, analyzing and reporting information (Kumar et al., 2008). Researchers have found that companies using IT systems reported fewer IC weaknesses than those that have not adopted IT systems (Klamm & Watson, 2009; Morris, 2009). Morris (2011) argued that the "built-in control" features and other features that ERP systems have can help an organization to improve its ICPs and reduce its IC weaknesses.

ERP systems are able to support other frameworks such as ERM and COSO frameworks (Brown and Caylor, 2006). ERM is a framework that can manage and reduce the different types of risk. Ramamoorti and Weidenmier (2006) stated that the technology is associated with all of the COSO ERM frameworks' components. Chang and Jan (2010) designed an ERP IC framework using COSO components and other items. They stated that the framework can help the shareholders, managers, and auditors to assess the effectiveness of ICPs.

Although the academic literature has studied the areas of ERP systems and the area of IC, it has paid too little attention to study the impact of ERP systems success on IC (Huang et al., 2008). According to Al-Mashari (2003), many companies that have implemented ERP have failed to achieve the system estimated benefits (e.g. cost reduction). It has been argued that assessing the value of the system is perhaps what the company should do (Heo and Han, 2003). Basically, assessing ERP success refers to evaluating the performance of an ERP system post-implementation. Gable et al. (2003) defined an ERP system's success as the utilisation of the system to achieve the organisational goals. The literature on hand includes several IS (ERP) success model, for

instance DeLone and McLean's (1992) model, Myers et al. (1997) and Gable et al. (2003) (Table 1).

Table 1. The IS and ERP Success Models

Authors	The Model	dimensions	contributions	limitations
DeLone & McLean (1992)	Information System Success Model	<ul style="list-style-type: none"> - System Quality - Information Quality - Use - User satisfaction - Individual Impact - Organisational Impact 	<ul style="list-style-type: none"> - Measure the IS success in different levels - Classification for multitude of IS evaluation. - Different stakeholders evaluating the IS success 	<ul style="list-style-type: none"> - Did too much - Inappropriateness of the use as a dimension. - Overlapped of user satisfactions
Myers, Kappelman & Prybutok (1997)	Comprehensive Model for Assessing the ISF	<ul style="list-style-type: none"> - DeLone & McLean (1992) 6 components - Service Quality - Work Group Impact, 	<ul style="list-style-type: none"> - Consider the overlap - Describes how measures can be determine. - Contingency factors 	<ul style="list-style-type: none"> - Carried some DeLone & McLean model problems
Gable, Sedera & Chan (2003)	ERP Success Measurement Model	<ul style="list-style-type: none"> - System Quality - Information Quality - Individual Impact - Organisation Impact, 	<ul style="list-style-type: none"> - First assessed the ERP success and tested. - Eliminated two of DeLone and McLean's dimensions - Complete set of tested ERP measures. 	<ul style="list-style-type: none"> - Tested data only from Australian public organisations, only SAP. - Ignoring the Service Quality dimension.

The Theoretical Framework

Contingency Theory Perspective

The contingency theory of an organisation is a theoretical lens that can be used to view the organisation. Some theorists, such as Burns and Stalker (1961), Perrow (1970) and Galtung (1967), have structured it within the time of the organisation theory. Otley (1980) notes, with regard to the contingency approach, that 'there is no universal appropriate control system which applies to all organization in all circumstance' (pp413). Donaldson (2001) defines the theory at an abstract level: 'the effect of one variable on another depends upon some third variable'(pp.5). Thus, there is no one best way to organize an organisation and the optimal cause of action depends on external or internal variables. For example, X is the independent variable, Y is the dependent variable and Z is the third variable. According to contingency theory, the effect of X on Y when Z is high differs from that when Z is low. The third variable, Z, moderates the relationship between the independent and dependent variables. Therefore, the contingency variable is called the moderator or conditioning variable of the relationship (Galtung, 1967).

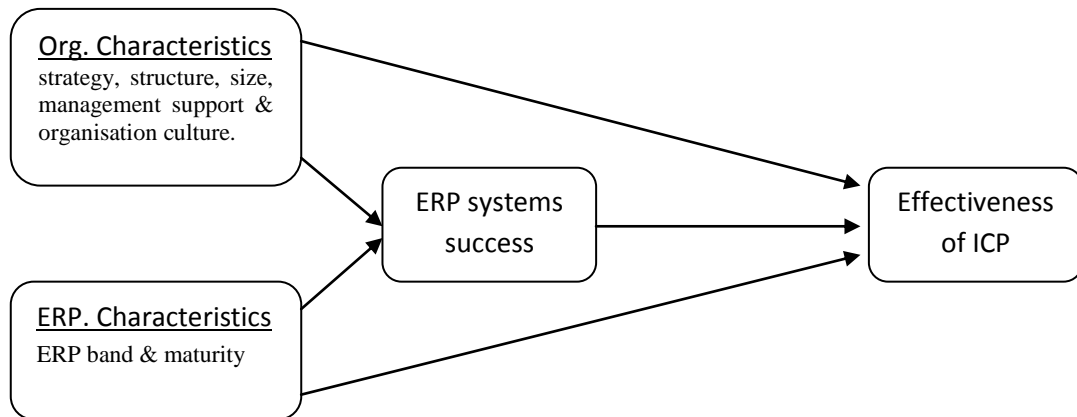
A number of works have identified the contingency variables (Fisher, 1998;Chenhall, 2003;Abdel-Kader and Luther, 2008). Some contingency variables have been more widely considered than others. Therefore, for this study, the researcher follows two steps in order to identify the most important

contingency variables. In the first step, the top accessible journals in the field of Accountancy and Information Management have been reviewed (The Association of Business School, 2010). The aim of this step is to categorize the prior studies related to contingency theory and ERP systems or IC. In the second step, two academics reviewed the results of the first step. The study assessed seven contingency variables: organisational structure, organisational strategy, size, organisational culture, management support, ERP system brand, and maturity.

Development of the Research Propositions

In order to investigate the relationship between ERP systems and IC efficiency and understand the relationship between the variables and components, a theoretical framework was developed (Figure1), based on three main relationships. These three relationships are illustrated by three propositions.

Figure 1. *The Study’s Theoretical Framework*



Proposition 1: Concerning ERP success and CVs.

Proposition 1 suggests that the seven CVs are positively associated with ERP success. The contingency theory posits that matching the organisational characteristics and contingency variables can enhance the organisational effectiveness (Drazin and Van De Ven, 1985). Therefore, this proposition proposes that the seven CVs are critical in influencing the effectiveness of ERP success after implementation, and help to improve the quality of the ERP functions. Myers et al. (1997) indicated that considering contingency theory would improve the quality and productivity of the IS functions in order better to meet the needs of an organization. Despite the importance of the contingency variables for assessing ERP success, few studies have investigated this issue (Ifinedo, 2006;Petter et al., 2008;Gable et al., 2008). Ifinedo (2006) suggested that future study might incorporate the impact of the CVs, such as the organisational structure, strategy, and size, on ERP system success. Consequently, more support evidence is required.

Proposition 2: Represent the Efficiency of ICPs and CVs

Proposition 2 suggests that there is a relationship between the effectiveness of ICPs and CVs. Fisher (1998) argued that better organizational performance depends on a better match between the control system and CVs. The study's CVs are theoretically associated positively with the ICPs (Chenhall, 2007). The COSO's ERM (2004) framework states the importance of applying the ERM and IC processes to the entity's strategy setting. In practice, the entity must align its strategy with its risk appetite. Turner and Owhoso (2009) stated that adopting a proper organisational structure would improve the IC. However, limited studies have empirically examined the impact of CVs on ICPs (Chenhall, 2007). Therefore, it is important to consider the impact of the research's CVs on the ICPs in order to explain the effectiveness of the latter.

Proposition 3: Concerning ERP Success and ICPs

The main aim of this research is to investigate the impact of ERP success on the effectiveness of ICPs. Little empirical relative research has been conducted on ERP systems and IC (Huang et al., 2008). Most of these studies measure the quality of the IC based on the 10-K report (an annual report required by the U.S. Securities and Exchange Commission (SEC) to report IC problems). This research will use the eight components of the COSO's ERM framework to investigate the effectiveness of ICPs. Several studies have demonstrated the relationship between the ERP system and the COSO framework(s). Brown and Caylor (2006) indicate that an ERP system is able to support other frameworks, such as enterprise risk management (ERM). Chang and Jan (2010) designed an ERP internal control framework using COSO components and other items. They stated that the framework can help shareholders, managers, and auditors to assess the effectiveness of ICPs. Interestingly, Morris (2011) found a positive relationship between the COSO frameworks and ERP systems.

The following section outlines the methodology used to achieve the research objectives.

Methodology

With regard to the methodology, the previous literature on the impact of ERP systems on IC procedures constitutes few empirical studies. There is no scientific evidence, as far as the researchers are aware, that can help them to determine what questions should be included on the questionnaire. Moreover, the research aims to obtain a comprehensive, broad picture of a new phenomenon in the study field. The researchers ended up using an exploratory field study method. Granlund and Malmi (2002) stated that multi-organisation field study can be the first step when the research aims to identify the sort of impact between two or more variables. Usually, an exploratory field study provides qualitative data (Zikmund, 1997) that is used to understand the

research problem rather than providing qualitative data or accurate measurements.

There are several instruments that can be used to collect the exploratory study data, such as in-depth interviews, focus group interviews, questionnaires, and secondary data (Collis and Hussey, 2009). The research data were collected from written documents and interviews. The exploration of the written documents should be the first step in an exploratory study (Blumberg et al., 2008). Within the exploratory study, the researchers started with an organisation's documents, such as the financial statements, auditors' reports and management reports. Another instrument used in this research is interviews. There are different types of interview, such as unstructured interviews, semi-structured interviews, and face to face interviews. This research used semi-structured interviews, which can help the researcher to explore any issues that may arise during the interviews (Blumberg et al., 2008). Additionally, the questions in this type of interview are likely to be open questions, that will help the researcher to explore the research problem and gather broad information (Collis and Hussey, 2009). The research sample includes small, medium and large companies, and also companies that have implemented ERP systems and those that have not. This helps the researcher to investigate the impact of ERP systems on IC procedures. Fourteen interviews with well-informed people from 12 SA companies were conducted in order to achieve the research objectives (Table 2).

Table 2. *The Exploratory Study*

no	Firm code	interviewee	Firm size	ERPs brand	Type of firm
1	A	Director of Internal Audit dep. & Internal Auditor	Medium	SAP	Public Joint-stock
2	B	Director of Technical Affairs	Large	SAP	Public Joint-stock
3	C	Director of Internal Audit de.	Large	SAP	Public Joint-stock
4	D	Internal Auditors (IT expert) & Specialist Regulatory Compliance	Large	SAP	Public Joint-stock
5	E	Chief of RM dep.	Medium	Legacy sys.	Partnership
6	F	Chief of Accounting dep.	Large	Oracle	Public Joint-stock
7	G	Director of IC dep.	Large	Oracle	Private Joint-stock
8	H	Financial Manager	Large	QAD	Private Joint-stock
9	I	Chief of Accounting dep.	Small	Oracle	Partnership
10	J	Human resources Manager	Medium	Legacy sys.	Private Joint-stock
11	K	Financial Manager	Medium	ACCP922	Partnership
12	L	Financial Manager	Medium	Legacy	Private

Exploratory Study's Results

The research started by analysing written documents, as this plays a prominent role in an exploratory study (Blumberg et al., 2008). The research relies on multiple secondary data sources, such as financial statements, internal reports (provided by the interviewees), external auditor reports, and the firm's websites. These sources helped the researcher to gather information such as the firm's size, the type of company, and the external auditors' opinion. This exploratory study covers a variety of company sizes and types (Table 2). Furthermore, during the last five years, all 12 firms received an unqualified opinion from their external auditors.

In the second stage, the interview instrument was used to collect the main data. The analysis and reporting of the research's main data follow the content analysis (Collis and Hussey, 2009). Four major themes were built: IC requirements and regulations; the effectiveness of the IC; the effectiveness of the companies' information systems (ERPs or Legacy); and ERP systems and ICPs. These themes were related to the research propositions. From this exploratory study, the researchers built a body of knowledge and gained insights into IC procedures in SA. The report of the finding is structured along the interviews' main themes (Table 3). Under each theme, the interviewees made several comments, which will be discussed briefly.

Table 3. *The Interview Questions*

	Major themes	Sub-themes
1	IC requirements	-Local IC regulations. -International regulations - COSO framework.
2	The effectiveness of the IC	- The existence and function of COSO components. - The roles of the IC departments. -The independency of the internal auditors -Organisations' characteristics.
3	The effectiveness of the companies' IS	-ERP systems & ERP systems' success -Organisations' characteristics -Legacy systems
4	ERP system and ICPs	-The support of ERP systems to ICPs -The most important organisational characteristics that may affect the relationship

The IC Requirements

All of the firms that were investigated have an IC department or group, yet different companies follow different bodies' requirements or regulations (Figure 2). In fact, this is complicated to illustrate in detail, but the study pointed out the most important bodies. For example, if the government owns more than 30% of the company, as is the case for companies A, B, C, D and F, then the company must comply with the Saudi General Auditing Bureau (SGAB) requirements. On the other hand, if a company deals with a foreign government, then it must follow the Institute of Internal Auditors requirements. The Financial Manager of company K stated: '*We are doing too much work,*

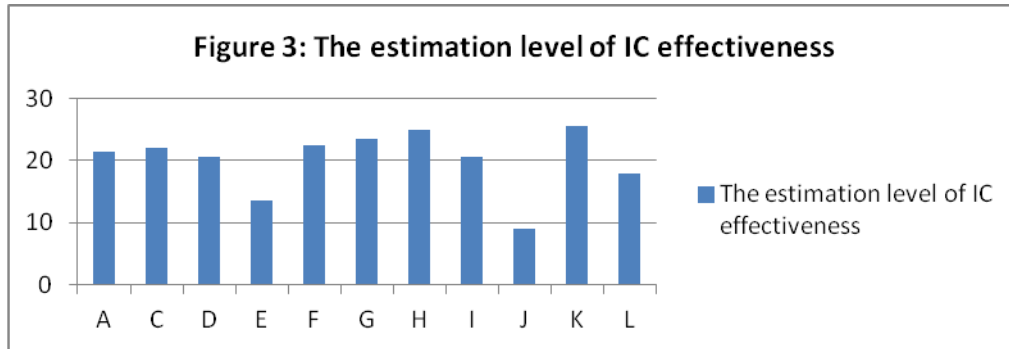
because we have a foreign partner so we have to consider different requirements, such as the Saudi Arabian General Foreign Investment Authority, International Organization for Standardization'. Another participant complained that the IC requirements were insufficiently efficient. The Chief of Accounts of company F said: 'Unfortunately, there is no specific body looking after the IC; even the SGAB just reviews the internal auditors' report'. To sum up, there is no clear picture of the IC regulations in SA, yet companies with a foreign partner have stronger ones. There should be specific IC regulations for all SA companies.

Figure 2. Internal Control Requirements for Different Types of Company

Government	<ul style="list-style-type: none"> •General Auditing Bureau
public Joint-stock	<ul style="list-style-type: none"> •Institute of Internal Auditors •Capital Market Authority •General Auditing Bureau (government own \geq 30%)
private Joint-Stock	<ul style="list-style-type: none"> •Capital Market Authority •Institute of Internal Auditors •-Best practice
partnership	<ul style="list-style-type: none"> •Best practice •Institute of Internal Auditors (others if involve foreign)
Sole Trader	<ul style="list-style-type: none"> •Best practice

The Effectiveness of the IC

Although the Saudi Internal Audit Standards refer indirectly to the COSO (1992) framework, some of the participants in this study have no clear idea about this framework. However, after the interviewer defined the framework and its components, the issue became clearer. The 14 interviewees indicated that most of the components normally exist, but there are variations regarding their level of implementation. For example, for the information and communication components, the Director of Internal Audits of company C stated: 'The IC department has the authorisation to access any information they need', whereas the IC department of companies E, F, J and L have to request most of the information. Regarding the level of the existence and functioning of the COSO components in the companies' sample, the researchers converted the qualitative data into numerical data, except for company B (the interviewee had insufficient data) (Figure 3). To sum up the finding, although the companies have to some extent acceptable IC procedures, those with a legacy system, such as companies E, J and L, have a low level of IC effectiveness. Also, the private companies (with a foreign partner) such as K and H have got the highest level of IC effectiveness. There is more to explain and investigate, especially regarding the impact of the organisational characteristics on the ICPs. All of the participants agreed with the importance of the research's seven CVs.



Additionally, most of the interviewees stated that the internal auditing department or group is normally the body responsible for IC and RM tasks. However, the question that should be asked is: Are the internal auditors independent? And does it matter? The Financial Manager of company H stated that *‘for our nine companies, every internal audit department reports directly to our audit committee’*. Yet, companies J, K and L have no independent internal auditors, as pointed out by the interviewees. Interestingly, company G’s Director of the IC Department stated: *‘The internal auditors have to be independent but in the work place there is nothing of that. We call them “internal” auditors, so it must be somehow a relationship’*. The independency of the internal auditors is debated in the literature. Brown (1983) found that the independency in auditing is very important to the internal auditors’ work, whereas Wright and Capps (2012) found that the lack of internal audit independence has a small impact on the internal audit quality.

The Effectiveness of the Companies’ IS (ERPs or Legacy system)

Generally, the companies with an ERP system point out that these systems have reduce their costs, increased the results and reports, and reduced errors (except for human errors). The interviewees from companies A and C stated that the SAP system is “a great system”. However, the impact of ERP systems can differ from one company to another. As some of the contributors indicted, many variables have to be considered, such as the maturity of the ERP systems; the implementation of the ERP system by companies A, C and F has taken more six years to reach the stage mature, while companies D, G, H, K and I spent less than three years on full implementation, but company B is still having problems its ERP system implementation. The Director General of Technical Affairs of company B said: *‘Our management needs to implement SAP software on our old system’*. Additionally, some interviewees indicated the importance of other variables that may impact on the success of ERP systems. The interviewees from company D indicated the importance of the strategy, management philosophy and the size of the system.

Regarding ERP success, the exploratory study found, as Chien and Tsaor (2007) discovered in their empirical study, that system quality and service quality are very significant dimensions for evaluating ERP system success. The interviewee from company B stated: *‘The quality dimensions are important in the design and commissioning of the system, but the impact dimensions are*

critically important when running the system'. On the other hand, the Legacy system companies agreed with the need to implement an ERP system in order to improve the work and reduce the cost. The interviewee from company E stated: *'The method that we are using for the internal communication is inefficient'*.

ERP System and ICPs

The exploratory study showed how ERP systems can support the ICPs. Company F's Chief of Accounts stated: *'The Oracle system acts as a SOLDIER in terms of protecting the firm from manipulation and errors'*. The firms adopt certain applications to support the internal auditor(s); for example, company A has the 'Audit Model' application, while 'company D' an 'Audit Information System' and is planning to adopt the 'Global Risk Control' application. Company E's Chief of RM stated: *'We are using email and post to request information. If the firm has implemented ERPs, it would help to get the information and theoretically improve the job if the users are well aware of the system'*.

Additionally, certain variables play a very important role in improving the relationship between ERP systems and IC, such as the maturity of the ERP system, the firm's size and the firm's strategy (company B and K). Interestingly, the participant from company G pointed out that: *'The success of the ERP system and its impact on IC depends on the management and how they provide the users with what they need'*.

Conclusion

Our exploratory field study provided a helpful insight into the relationship between ERP systems and IC. ERP system can provide support to ICP. However, this study has some limitations. The number of interviews was small. The questions used to estimate the effectiveness of ICPs were open-ended questions, which may cause concerns with the potential bias. Also, information regarding the CVs collected from interviews was not sufficient. Lastly, qualitative data is used to address the question of whether an ERP system can provide adequate support for the IC procedures, which require further investigation to confirm the findings. Therefore, a large scale survey research is needed in order to overcome the limitations and validate the findings.

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