MAPPING FACTORS INFLUENCING EAI ADOPTION IN THE LOCAL GOVERNMENT AUTHORITIES ON DIFFERENT PHASES OF THE ADOPTION LIFECYCLE

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Abstract

Several private and public organisations have adopted Enterprise Application Integration (EAI), however, its application in the Local Government Authorities (LGAs) is limited. Although, there exist few EAI adoption models, these models mainly focus on a number of different factors (e.g. benefits, barriers, cost) influencing the decision making process for EAI adoption. Moreover, these models do not illustrate which factor(s) influence the decision making process for EAI adoption on the adoption lifecycle phases. Literature indicates that the adoption process involves a sequence of phases an organisation passes through before taking the decision for adoption. This exemplifies that LGAs may also have to pass through several adoption phases before taking the decision to adopt EAI. However, due to the: (a) multiplicity of diverse EAI adoption factors and (b) not able to recognise which factor(s) influence EAI on adoption lifecycle phases, it may not be easy for LGAs to take decisions to adopt EAI by merely focusing on different factors. This may impede the decision making process for EAI adoption in LGAs. Notwithstanding, the implications of EAI have yet to be assessed, leaving scope for timeliness and novel research. Therefore, it is of high importance to investigate this area within LGAs and result in research that contributes towards successful EAI adoption. This paper makes a step forward as it: (a) investigates and proposes four adoption lifecycle phases, (b) validates the adoption lifecycle phases and (c) mapping the factors influencing EAI adoption on the adoption lifecycle phases, through a case study. Hence, it significantly contributes to the body of knowledge and practice. In doing so, providing sufficient support to the decision makers for speeding up the decision making process for EAI adoption in LGAs.

Keywords: EAI Adoption, LGAs, Factors, Mapping, Adoption Lifecycle Phases.

1 INTRODUCTION

Literature indicates that several researchers have proposed EAI adoption models e.g. Themistocleous (2004) proposed EAI adoption model in multinational organisations, Khoumbati (2005) followed the stream by evaluating and proposing a model for EAI adoption in healthcare organisations, Mantzana

(2006) utilised Khoumbati (2005) EAI adoption model and extended the research area in healthcare sector, by identifying the healthcare actors involved in EAI adoption process and the causal relationships among the healthcare actors and factors that influence EAI adoption. In the area of the local government authorities, Kamal and Themistocleous (2006, 2007) proposed and validated an EAI adoption model. Chen's (2005) model differs from other existing EAI adoption models. This is because Chen (2005) did not specifically research on EAI; instead Chen (2005) identified the significant differences in the way Small and Medium Enterprises (SMEs) and large companies approach integration technologies.

These models mainly focus on a number of different factors (e.g. benefits, barriers, costs) influencing the decision making process for EAI adoption. In addition, there are differences indicating that the factors that influence the decision-making process for EAI adoption differ from one type of organisation to the other depending among others on the nature and size. For instance, one set of factors is used to support EAI adoption in SMEs and another in large organisations, whereas, there are differences among influential factors that are used in private sector, healthcare organisations and the local government authorities. The aforesaid EAI adoption models do not: (a) address the adoption lifecycle phases and (b) illustrate which factor(s) influence the decision making process for EAI adoption on the adoption lifecycle phases. Rogers, (1995) suggests that adoption process involves a sequence of phases an organisation passes through before taking the decision to adopt a technological solution(s).

In the context of technology adoption, several researchers propose diverse phases in their technology adoption processes e.g. Kamal (2006), Frambach and Schillewaert (2002), Gallivan (2001) and Darmawan, (2001). On the contrary, in the context of EAI implementation, several researchers put forward different phases in their EAI implementation process e.g. Lam and Shankararaman (2004), Themistocleous and Irani (2006) and Reiersgaard *et al.*, (2005). Technology adoption process illustrates several phases that focus on both the pre-adoption and post-adoption phases, whereas, EAI implementation process exhibits post-adoption phases. Despite their contribution to the technology adoption and EAI implementation area, the authors do not cover these phases in the context of this research.

The reason is that the current research investigates on the adoption lifecycle phases and mapping of factors influencing the decision making process for EAI adoption in LGAs on adoption lifecycle phases and not on EAI implementation phases or beyond. In the area of mapping the factors influencing EAI adoption, Khoumbati and Themistocleous, (2007) proposed a modelling technique i.e. Fuzzy Cognitive Mapping (FCM) simulation to evaluate EAI adoption in healthcare organisations. Nevertheless, their research merely demonstrates the causal inter-relationships between the EAI adoption factors (Khoumbati and Themistocleous, 2007) and does not interpret the mapping of the factors influencing EAI adoption on the adoption lifecycle phases.

Thus, it can be argued – despite the fact that the private and public organisation's decision to adopt EAI may in fact be the most important development for integrating their heterogeneous IT infrastructures. Nonetheless, to the best of the authors' knowledge, there is lack of broad-based theoretical and empirical research on mapping the factors influencing the decision making process for EAI adoption in LGAs on the adoption lifecycle phases. Thus, given the increasing attention to EAI adoption by academics (Mantzana, 2006; Khoumbati, 2005; Themistocleous, 2004), the authors attempt to further investigate on the adoption lifecycle phases and mapping of factors on adoption lifecycle phases in the local government domain. The necessity for relatively similar research is highlighted in the normative literature (Janssen and Cresswell, 2005; Somers and Nelson, 2001; Prescott and Conger, 1995).

2 ENTERPRISE APPLICATION INTEGRATION

EAI is a generation of software that combines a variety of integration technologies e.g.: (a) message brokers, (b) adapters, and (c) application servers etc, to build a centralised integration infrastructure (Lam, 2005; Themistocleous, 2004; Linthicum, 2000). It incorporates functionality from a diversity of systems and results in the development of flexible, and maintainable integrated IT infrastructures (Serian, 2002; Zahavi, 1999). EAI also allows the organisations to simplify interactions among organisation applications by adopting a standard approach to integration, replacing hundreds or thousands of ad hoc integration designs (Ruh *et al.*, 2001). Organisations that integrated their IT infrastructures with EAI have reported benefits (Bass and Lee, 2002). Themistocleous and Irani (2001) analysed and explained the benefits that derive from the use of EAI technology and classified them into: (a) organisational (e.g. results in more organised business processes), (b) managerial (e.g. achieves return on investment), (c) operational (e.g. reduces cost), (d) strategic (e.g. increases collaboration among partners), and (e) technical (e.g. achieves data, objects and process integration).

However, the high investment costs associated with EAI have caused much concern for many organisations (Chen, 2005). Sanchez *et al.*, (2005) argues that although the initial cost of investing in EAI technological solutions may be daunting to several sector organisations, the cost of integration are in fact more extensive when EAI technological solutions not adopted. The authors report here that on prolonging the integration problem is likely to be more costly than an initial EAI investment, especially when long-term plans including new technologies and IS into the IT infrastructure. The reason may be that while not taking integration into consideration, each application that is initially developed based on own requirements, may have its own meaning of organisational objects (e.g. citizens). Thus, each application that has data (with own meaning) may overlap with data in other applications. This data redundancy and inconsistency generates significant data integrity problems and increases the maintenance and integration cost.

3 CURRENT RESEARCH AND FACTORS INFLUENCING EAI ADOPTION IN LGAs

LGAs are complex organisations and have developed their own structures and systems according to their requirements (Senyucel, 2005). Nye (1999) states that such LGA structures are based traditionally on a bureaucratic model that emphasizes decentralisation and specialisation in a mechanical and pre-planned approach. LGA service delivery and administration is also tended to be organised in the same bureaucratic manner (Senyucel, 2005). Due to the bureaucratic nature and their culture, LGAs have been experiencing from what may be termed as – IT lag time (Beaumaster, 2002). The authors indicate that LGAs have experienced approximately ten years of lag time between the adoption of new technologies and Information Systems (IS) and its acceptance and routinisation across the organisations (Danziger and Kraemer, 1986). This illustrates that LGAs have been laggards in adopting new technological solutions (Kamal and Themistocleous, 2006; 2007).

The authors report that laggards can be summarised as those who adopt a technology only when they have no choice. In fact, many laggards do not explicitly adopt technologies at all, but rather acquire them accidentally when a particular technology is a component of a packaged solution (Rogers, 1995). Sometimes LGAs are forced to adopt new technologies, as other LGAs may require them to adopt as well (Kamal and Themistocleous, 2006; 2007). Thus, LGAs may be categorised in the late majority group. There might be an exceptional case where LGAs might be considered as innovators, such as cases where LGAs (Singapore) that have proactively adopted sophisticated information technologies to boost their economy (Devadoss *et al.*, 2002). Whereas, in other cases, LGAs wait until a technology becomes mature and then push the private sector to adopt this technology (Themistocleous *et al.*, 2004).

The authors argue that EAI adoption by LGAs does not significantly differ from other information technologies adopted within LGAs. However, today there are only a few published research case studies for EAI adoption in local government domain (most of them discuss EAI adoption in healthcare, SMEs and multinational organisations). The lack of published cases can be attributed to: (a) LGAs adopt new IT reactively compared to private organisations (Themistocleous, 2004), (b) lack of skilled staff, understanding and knowledge on EAI in LGAs (Kamal and Themistocleous, 2006; 2007), (c) LGAs have been very slow or even unprepared for technological transformations (Devadoss *et al.*, 2002), and (d) LGAs are unable to react proactively as technologies constantly change and evolve around them (Beaumaster, 2002). Additionally, several LGAs consider that the uncertainty about the costs and benefits of adopting EAI is a central problem (Janssen and Cresswell, 2005). The reason is that the information needed about costs and benefits may be incomplete or inaccessible to several LGAs.

Carter *et al.*, (2001) argues here that the access to information can be limited by organisational and functional boundaries that distribute knowledge of value-added activities such that no one, including top management, has complete knowledge of the processes. Due to the lack of insight, LGAs are reluctant to adopt EAI unless forced to do so (Janssen and Cresswell, 2005). Moreover, LGAs do not know whether and to what extent they need to invest in EAI and they are unable to assess the return on investments. The decisions taken in one LGA may have a profound effect on the activities of other LGAs (Janssen and Cresswell, 2005). Often the implications for other LGAs are not clear, consequently other local government authorities do not want to invest or change their processes to profit from EAI. There is a debate about how costs are divided and how benefits can be distributed over LGAs. The authors note that these barriers may impede EAI adoption in LGAs.

In the context of EAI adoption in the private (e.g. multinational organisations and SMEs) and public domain (e.g. healthcare organisations and LGAs), there are differences indicating that the factors that influence the EAI adoption process differ from one type of organisation to the other depending among others on the nature and size. For instance, in healthcare organisations, Khoumbati (2005) reported ‘physician and patient relationship’ as a factor for EAI adoption. This factor is not relevant for LGAs or other sector organisations. The rationale is that ‘physician and patient relationship’ signifies the relationship involved between two actors that are specifically related to healthcare organisations and not other sectors. In this case, ‘physician and patient relationship’ factor cannot be considered in LGAs while taking decisions for EAI adoption.

Despite, existing models contributing in the area of EAI, these models may not be applicable or generalised to LGAs. Thus, in considering this as a literature void, Kamal and Themistocleous (2006; 2007) proposed and validated an EAI adoption model with several influential factors. These factors are well analysed in the government literature and provide sufficient support to the authors in understanding EAI adoption in LGAs. Table 1 illustrates the factors influencing the decision making process in the local government authorities.

Factor Category	EAI Adoption Factors	Sub-Factors	References
Pressure Factors (PF)	Project Champion	Internal Factor	Garfield (2000); Norris (1999).
	Citizen's Satisfaction	External Factors	Beynon-Davies, (2005); Beynon-Davies and Williams, (2003).
	Critical Mass		Akbulut, (2002); Bouchard (1993).
	Market Knowledge		Hong and Kim, (2002); Johannessen (1994).
Technological Factors (TF)	Evaluation Frameworks	-	Themistocleous *et al.*, (2005)
	Technological Risks	-	Ebrahim and Irani, (2005); Gil García and Pardo, (2005)
	IT Capabilities	IT Infrastructure	Norris (1999); Perry and Danziger (1980).
		Personnel IT Knowledge	Akbulut, (2002); Perry and Danziger (1980).
		IT Sophistication	Akbulut, (2002); Perry and Danziger (1980).
	Data Security and Privacy	-	Signore *et al.*, (2005); Lam, (2005).
Support Factors (SF)	Top Management Support	-	Kamal, 2006; Beath, (1991).
	IT Support	-	Themistocleous *et al.*, (2005)
	Higher Administrative Authority	-	Kim and Bretschneider (2004); Moon and Bretschneider, (1997).
Financial Factors (FF)	Financial Capability	ROI	Lam (2005); Janssen and Cresswell, (2005).
		Cost	Themistocleous *et al.*, (2005)
Organisational Factors (OF)	Centralisation	-	Ebrahim *et al.*, (2004); Melitski, (2003).
	Managerial Capability	-	Senyucel (2005); Kim and Bretschneider, (2004).
	Barriers	-	Themistocleous *et al.*, (2005).
	Benefits	-	Themistocleous *et al.*, (2005); Bradford and Florin (2003).
	Formalisation	-	Ebrahim *et al.*, (2004); Lee *et al.*, (2003).
	Size	-	Akbulut (2002); Brudney and Seldon, (1995).

Table 1: Factors Influencing EAI Adoption in LGAs

4 INVESTIGATING ADOPTION LIFECYCLE PHASES

Paul *et al.*, (2000) suggests that technology adoption can be considered as an organisation's decision to acquire a specific technology and make it available to target users for their task performance. On the contrary, technology adoption involves a sequence of phases an organisation passes through before taking the decision for adoption (Frambach and Schillewaert, 2002; Gallivan, 2001). Rogers (1995) explains that adoption is the process through which an individual or other decision-making unit passes from first knowledge of an innovation, to forming an attitude toward the innovation, to a decision to adopt or reject, to implementation of the new idea, and to confirmation of this decision. Several researchers proposed adoption lifecycle phases e.g. Kamal (2006) proposed a novel taxonomy of Information Technology (IT) innovation adoption with eight phases, Gallivan (2001) proposed three innovation adoption and implementation phases, whereas, Darmawan, (2001) proposed four phases of innovation adoption process.

With regards to organisational adoption, Gopalakrishnan and Damanpour (1997) also reported two main distinguishable stages: initiation and implementation of innovation. The actual adoption decision occurs between the initiation and implementation stage. In the initiation stage, the organisation becomes aware of the technology, forms an attitude towards it acceptance and evaluates the technology (Gopalakrishnan and Damanpour, 1997). In implementation stage, the organisation decides to purchase and make use of IT. Nevertheless, such organisational adoption decision marks merely the beginning of the actual implementation of technology.

From this point onwards, the acceptance or assimilation becomes vital in the organisation. Gopalakrishnan and Damanpour (1997) and Rogers (1995) point here that technology adoption process can only be considered a success to the extent that technology is accepted and integrated into the organisation and the target individual adopters demonstrate commitment by continuing to use the technology over a period of time. The aforesaid research studies illustrate important adoption phases, however, these adoption studies also discuss on phases beyond the adoption phase i.e. focusing on both the pre-adoption and post-adoption phases. However, it is not the intent of this research to investigate on phases beyond the adoption phase. The reason is that as the current research investigates on EAI adoption not on EAI implementation and beyond as reported earlier. The authors attempt to move this research a step forward and propose four adoption lifecycle phases and map the factors influencing the decision-making process for EAI adoption in LGAs on adoption lifecycle phases (motivation, conception, proposal, and adoption decision) in Figure 1.

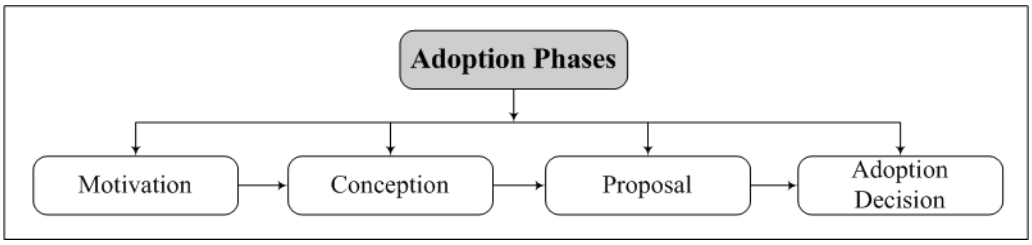

Figure 1: Proposed Adoption Lifecycle Phases

4.1 Motivation

Motivation signifies the state when an organisation becomes aware of a specific technology and attempts to acquire knowledge about the technology, further leads to motivating the organisation in ascertaining an attitude towards its adoption (Kamal, 2006; Becker and Whisler, 1967). Frambach and Schillewaert (2002) and Darmawan (2001) have described this state as initiation phase in their respective models. Rogers (1995) reports this stage as knowledge and states that knowledge occurs when an individual or (decision-making unit) is exposed to innovation's existence and gain some understanding of how it functions. Thus, it can also be said that motivation is a natural phenomenon i.e. when any organisation realises a problem that may be solved by a specific technology, the organisation is motivated to attain knowledge about how the technology may resolve their problem.

4.2 Conception

Conception phase refers to a plan of action that the organisation should pursue. In highly innovative organisations presumably this phase (conception) is exhibited by a number of organisational members such as creating an attitude towards technology adoption (Kamal, 2006; Becker and Whisler, 1967). Agarwal and Prasad (1998) refer to this stage as *perception*, towards technology adoption. Rogers (1995) refers this stage as persuasion. Persuasion occurs when an individual (or a decision-making unit) forms a favorable or unfavorable attitude towards innovation adoption (Rogers, 1995). Thus, it appears that conception phase is directly related to the motivation phase. For instance when if an LGA is motivated to invest in EAI, the decision makers may indeed attempt to acquire the details i.e. to develop some views as to how EAI may assist them in solving their problems.

4.3 Proposal

Proposal refers to making a formal proposition for technology adoption to rest of the organisation (Kamal, 2006; Becker and Whisler, 1967). The researcher asserts that proposing the innovative idea to the rest of the organisation is very crucial for making technology adoption decision. At this phase, the departments making decisions to adopt technology need to provide substantiated reasons for approval from the organisation, besides this the departments need to analyse their requirements and assess their

capabilities for acquiring a technology. Dixon (1999) reports that analysing the fit of technology is an influential factor for technology adoption. In several organisations, a formal justification proposal is prepared and accepted by decision-makers, prior to any investment or expenditures (Irani *et al.*, 2002). Whereas, Paul *et al.*, (2000) signifies proposal submission as the commencement of a formal technology adoption process i.e. opting to move towards the adoption decision. Thus, it can be said that the probability of an organisation's adopting a technology will increase as its current adoption stage moves up the adoption continuum. For instance, an organisation that has already submitted a formal adoption proposal under organisational funding is more likely to adopt the technology than organisations that have thought about potential adoption but decided not to pursue it at present (Paul *et al.*, 2000).

4.4 Adoption Decision

Adoption Decision is the actual phase where organisations take the decision to adopt a specific technology (Kamal 2006; Frambach and Schillewaert, 2002). Darmawan (2001) analysed adoption phase at two levels: (a) at organisational level adoption i.e. when an organisation begins to realise the need for strategic change and decides to adopt technology, thus, the decision ends with the acquisition of technology, and (b) the individual level adoption, commences with the acquisition of technology, and finishes when technology is utilised. Karahanna *et al.*, (1999) reports that the phases leading the adoption decision as pre-adoption phase (where the target behaviour is technology adoption), and the phases following the adoption decision collectively as post-adoption phase (where the target behaviour is the continuous technology usage). The current research only covers the pre-adoption phases, not the post-adoption phases.

Section 3 highlighted factors influencing EAI adoption in LGAs and in this section, the authors proposed adoption lifecycle phases. Kamal and Themistocleous (2007) validated the factors (Table 1) through a case study in their previous research case study; nevertheless, the adoption lifecycle phases and mapping of factors on the phases are yet to be validated. Thus, the authors take into consideration the adoption lifecycle phases as a *research issue* and attempt to validate them through another case study in the subsequent sections.

> ***Research Issue 1 - Adoption Lifecycle Phases:*** *LGAs can pass through several phases while adopting EAI.*

5 MAPPING EAI ADOPTION FACTORS ON ADOPTION LIFECYCLE PHASES

The research conducted hitherto indicates that the process of EAI adoption and use in different sectors is significant in deriving the benefits of enterprise application integration. The existing studies on EAI adoption have investigated on factors, actors and the causal relationship among and between them. Yet from a conceptual and empirical point of view, none of the existing studies related to EAI adoption investigated on the mapping of the factors influencing EAI adoption on adoption lifecycle phases. The authors consider this as a literature void and report that it is important to understand and manage EAI adoption in LGAs. This can be attributed to several reasons (both in the areas of EAI and LGAs) including among others: (a) EAI is very often considered as high-risk project (e.g. Janssen and Cresswell, 2005; Themistocleous and Irani, 2002), (b) proliferation of EAI technologies (Linthicum, 2000). On the other hand, LGAs are characterised as laggards and often resist to the technological changes, however, these changes should therefore be managed as their importance in bringing change in the organisation is vital (McIvor *et al.*, 2002).

With such literature findings, the authors suggest that it is important to study the mapping of factors influencing EAI adoption in the local government authorities on different adoption lifecycle phases.

With the factors influencing EAI adoption in LGAs and the mapping of the factors on adoption lifecycle phases, make a novel contribution at conceptual level. Nevertheless, the actual mapping of factors on adoption lifecycle phases is carried out after conducting empirical research. Hence, the authors suggest that while adopting EAI, realising the factor(s) that influence the decision making process for EAI adoption in LGAs on adoption lifecycle phases may provide much deeper understanding on the EAI adoption process. Therefore, the authors take into consideration the mapping of factors influencing EAI adoption on adoption lifecycle phases as a *research issue* and attempt to map the factors through a case study in the subsequent sections.

> ***Research Issue 2 - Mapping EAI Adoption Factors:*** *The influential factors for EAI adoption can be mapped on different adoption lifecycle phases to support the decision makers while adopting EAI.*

6 RESEARCH METHODOLOGY

The role and the applicability of EAI remain under investigation within LGAs. This paper attempts to study the mapping of EAI adoption factors in LGAs on adoption lifecycle phases. The authors have followed an interpretive, qualitative case study approach to conduct this research. Interpretitivism stance was adopted, as the aim of this paper is to identify and understand which factor(s) influence(s) EAI adoption in LGAs on different phases of the adoption lifecycle. An interpretivism stance allows the authors to navigate and better explain this phenomenon. Also, the authors suggest that in the context of this research a qualitative approach is more appropriate as such approach can be used to: (a) investigate little-known phenomena like EAI, (b) examining and mapping EAI adoption factors on different phases of the adoption lifecycle, (c) examine the phenomenon in its natural setting and, (d) learn from practice. In addition, the authors used a multiple case study strategy to explore and understand i.e. examining and mapping factors influencing EAI adoption on different phases of the adoption lifecycle from three different departments within the same case organisation. In doing so, data collection methods such as interviews and observation were used (i.e. interviewing five staff members from three different departments).

The bias that is considered to be a danger in using qualitative research approach is overcome by data triangulation. The use of multiple data collection methods makes the triangulation possible, which provides stronger substation of theory (Eisenhardt, 1989). For the purpose of this paper, the authors used data triangulation – the use of variety of data sources e.g. interviews and observation during the interview sessions. However, to test the research issues in the practical arena, the authors investigated for an in-progress or a live EAI project within the local government domain. After a rigorous search, the authors managed to identify a case organisation (for confidentiality reasons, the authors use the name LGA_EAST_LONDON, to refer to the case organisation) where an EAI project was underway. The authors contacted the Personal Assistant (PA) to the Head of IT (HIT) at the Corporate Information and Communication Technology Department (CICTD) at LGA_EAST_LONDON and arranged to meet at a scheduled time. The authors acquired a written permission from their department explaining the purpose to visit the case organisation that was shown to the head of IT before commencing the interview.

7 CASE ORGANISATION – LGA_EAST_LONDON

LGA_EAST_LONDON provides its services through various departments including social and environmental services, property, housing, education, health etc. In the past, each department developed their own IT infrastructures. As a result, LGA_EAST_LONDON consisted of numerous heterogeneous information systems that were based on a diversity of platforms, operating systems, data structures and computer languages. Most of these systems were legacy applications that still

today run on mainframe environments. Since there was a lack of common IT infrastructure, and a lack of central coordination of IT, the majority of LGA_EAST_LONDON departments adopted their own applications to support their business activities. These individual applications were not developed in a coordinated way but in stead evolved as a result of the latest technological innovation.

This led to incompatible systems with integration problems. LGA_EAST_LONDON attempted to overcome this problem by integrating their systems. For example, the LGA_EAST_LONDON turned to Enterprise Resource Planning (ERP) implementations in an attempt to overcome the Year 2000 (Y2K) problem and automate its business processes. Although ERP systems have addressed the Year 2000 (Y2K) problem they only provide a partial solution for the integration problem. This is because ERP systems were not designed to integrate disparate systems but rather to replace them to achieve integration. The need for an integrated and flexible IT infrastructure was necessary as the existing IT infrastructure caused numerous problems. These problems became an obstacle for the case organisation and prevented them from implementing their business goals. For instance, LGA_EAST_LONDON could not support its goal of closer collaboration and coordination of inter-organisational business processes due to the non-integrated nature of its applications. This held LGA_EAST_LONDON back from achieving an integrated IT infrastructure and cost reductions.

After conducting interview with the head of IT, the authors managed to interview two other project team members i.e. Senior Development Support Engineer (SDSE), Service Delivery Manager for Applications (SDMA) on later dates. However, the authors also came to know (from the head of IT) that there were two other departments (i.e. Children Social Care Department [CSCD] and Citizen Service Department [CSD]) within the case organisation working on other EAI projects. The head of IT from CICTD managed to arrange meetings with his colleagues in these departments with Project Manager (PM) from CSCD and Web Manager (WM) from CSD at later dates. Each interviewee highlighted that their IT infrastructure was underdeveloped and not integrated and thus, several limitations existed in their IT infrastructures. The IT infrastructure limitations led individual departments to take a decision to significantly advance in their service delivery by adopting EAI technological solution and develop an integrated IT infrastructure.

Initially, during each interview, the authors discussed and shared views on the factors (Table 1) influencing EAI adoption in their respective projects. In doing so, the authors received similar views on few factors e.g. *project champion*, *top management support*, *managerial capabilities* and *barriers* were reported as the most influential factors within all three departments in their EAI projects, whereas, other factors had mixed views. The authors note here that the difference in opinion on factor importance and involvement can be attributed to each interviewee's observation, understanding and responsibilities within their distinct EAI projects. However, to have more precise understanding of the importance of each factor, the interviewees were asked to exemplify the importance of each factor using Miles and Huberman (1994) scale of less important (○), medium important (⦿) and most important (●) and where the interviewees did not respond, the authors used "×" symbol to illustrate as no response. Table 2 validates the importance of factors influencing EAI adoption in these departments.

			CICTD			CSCD	CSD
	Factors Affecting EAI Adoption	**Sub-Factors**	**HIT**	**SDSE**	**SDMA**	**PM**	**WM**
PF	Project Champion	Internal Factor	●	●	●	●	●
	Citizen's Satisfaction	External Factors	●	●	○	⦿	●
	Critical Mass		⦿	●	●	⦿	⦿
	Market knowledge		⦿	⦿	○	●	⦿
TF	Evaluation Frameworks	-	●	○	×	●	⦿
	Technological Risks	-	⦿	●	●	⦿	⦿
	IT Capabilities	IT Infrastructure	●	●	○	⦿	●
		Personnel IT Knowledge	●	●	⦿	●	⦿
		IT Sophistication	⦿	⦿	⦿	●	●
	Data Security and Privacy	-	●	●	●	⦿	⦿
SF	Top Management Support	-	●	●	●	●	●
	IT Support	-	⦿	●	⦿	●	⦿
	Higher Administrative Authority	-	●	⦿	●	●	●
FF	Financial Capability	ROI	●	●	●	⦿	⦿
		Cost	⦿	●	●	●	⦿
OF	Centralisation	-	⦿	●	●	⦿	●
	Managerial Capability	-	●	●	●	●	⦿
	Barriers	-	●	●	●	●	●
	Benefits	-	●	●	⦿	⦿	⦿
	Formalisation	-	⦿	●	●	⦿	●
	Size	-	⦿	⦿	●	⦿	●

Table 2: Validation of Factors Influencing EAI Adoption in LGAs

8 FINDINGS

The main findings derived from LGA_EAST_LONDON (CICTD, CSCD and CSD) case study presented earlier are summarised below along with the comments from the interviewees:

8.1 Testing the Adoption Lifecycle Phases

The interviewees were asked to comment and illustrate the importance of these phases based on the projects conducted in their respective departments. All the interviewees agreed that these phases are very important. For example the senior development support engineer and service delivery manager for applications mutually agreed that:

> *"… these phases are vital with a perfect breakdown … however, for adoption phase we call it an investment phase …"*

Whereas, the head of IT reported that:

> *"... the proposal and adoption decision phases are important and are the physical aspects whereas motivation and conception are not necessarily physical aspects ..."*

The interviewees from CICTD also reported new phases. For example, the head of IT and service delivery manager for applications reported that before the *motivation* phase, they passed through another phase i.e. *external driver* and/or *driving force* phase for their EAI project. They further added that in this phase, CICTD was driven by some external influences e.g. pressure from the central government, peer pressure and other stakeholder's (internal and external) influence to improve the service delivery. Due to this, CICTD was motivated to run an EAI project. In addition, the senior development support engineer stated that the project team also passed through another phase before

the *proposal* phase i.e. *discussion phase* and/or *research phase*. The interviewee reported that in this phase, CICTD had to do some research on the EAI solution and discussions were carried out with other colleagues before preparing a final proposal. The interviewee further added that we had to analyse our resources that were needed to actually enable to run the project.

After analysing the interviews from CICTD, the authors note that external driver and/or driving force phase can be the same as motivation phase. The reason is that an organisation may be motivated to take a step when it is either influenced internally due to some problem or externally through some stakeholders influence. Whereas, the discussion and/or research phase may also be the same as proposal phase. The rationale is that in proposal phase, the departments may need to do some evaluation and provide valid reasons for approval from the organisation, besides this the departments need to analyse their requirements and assess their capabilities for acquiring a technology. Interviewees from CSCD and CSD did not report any new phase; nevertheless, they highlighted the importance of these phases and pointed out that they came across these phases during their projects. For example, the project manager from CSCD reported that:

> "*… there is a definite attempt to thing about what the problem is and there is definitely a proposal for how to get there and definitely there are some senior people in the department to take the decision. So I think it is a fair lifecycle and does reflect the adoption phases at CSCD for EAI project …*"

Whereas, the web manager from CSD stated that:

> "*... I think it is a reasonable lifecycle and does reflect the adoption processes at CSD for our EAI project …*"

Thereafter, the interviewees were asked to illustrate the importance of the adoption lifecycle phases using Miles and Huberman (1994) scale as aforesaid. The importance of each phase is presented in Table 3.

	CICTD			CSCD	CSD
Adoption Lifecycle Phases	**HIT**	**SDSE**	**SDMA**	**PM**	**WM**
Motivation	⦿	●	●	●	●
Conception	⦿	●	●	●	●
Proposal	●	●	●	●	●
Adoption Decision	●	●	●	●	●

Table 3: Importance of Adoption Lifecycle Phases at LGA_EAST_LONDON Departments

The aforesaid empirical findings validate the adoption lifecycle phases and fulfill the purpose of *research issue 1 - Adoption Lifecycle Phases: LGAs can pass through several phases while adopting EAI*. Subsequently, the authors present the mapping of factors influencing EAI adoption on the adoption lifecycle phases.

8.2 Testing the Mapping of Factors on the Adoption Lifecycle Phases

The interviewees were asked to map the factors influencing EAI adoption on different phases of the adoption lifecycle. Horizontally, Table 4 illustrates the adoption lifecycle phases e.g. Mapping (M), Conception (C), Proposal, (P) and Adoption Decision (AD), whereas, vertically Table 4 represents the factors influencing EAI adoption in LGA_EAST_LONDON departments. The mapping of factors on different phases of the adoption lifecycle is based on the importance of each factor influencing EAI adoption in these projects.

			LGA_EAST_LONDON																			
			CICTD												CSCD				CSD			
	Factors Affecting the EAI Adoption	**Sub-Factors**	HICT				SDSE				SDMA				PM				WM			
			M	**C**	**P**	**AD**	**M**	**C**	**P**	**AD**	**M**	**C**	**P**	**AD**	**M**	**C**	**P**	**AD**	**M**	**C**	**P**	**AD**
PF	Project Champion	Internal Factor	✓	✓	✓	✓	–	–	✓	–	✓	–	–	–	✓	–	–	✓	✓	–	✓	✓
	Citizen's Satisfaction	External Factors	–	–	✓	–	✓	✓	✓	✓	✓	–	–	–	–	–	–	–	✓	–	–	–
	Critical Mass		✓	✓	✓	–	✓	✓	–	–	✓	✓	–	–	✓	✓	✓	–	✓	–	–	–
	Market knowledge		–	–	✓	✓	✓	✓	–	–	–	✓	–	–	–	✓	✓	–	–	–	✓	–
TF	Evaluation Frameworks	-	–	–	–	✓	–	–	–	–	–	–	✓	–	✓	✓	✓	–	–	✓	–	–
	Technological Risks	-	–	–	✓	✓	–	✓	✓	✓	–	✓	✓	✓	–	✓	✓	✓	–	–	✓	–
	IT Capabilities	IT Infrastructure	✓	✓	✓	–	–	✓	✓	✓	–	✓	✓	–	–	✓	✓	–	✓	✓	–	–
		Personnel IT Knowledge	–	✓	✓	✓	✓	✓	✓	✓	–	✓	–	–	✓	✓	✓	–	–	–	✓	✓
		IT Sophistication	✓	✓	✓	–	✓	✓	✓	✓	–	✓	–	–	✓	✓	✓	–	–	✓	–	–
	Data Security and Privacy	-	✓	✓	✓	–	✓	✓	✓	✓	–	✓	–	–	–	✓	✓	–	✓	–	✓	–
SF	Top Management Support	-	✓	–	✓	✓	–	✓	✓	✓	✓	–	–	✓	✓	–	–	✓	✓	–	–	✓
	IT Support	-	–	✓	✓	✓	✓	✓	✓	✓	–	✓	✓	✓	✓	✓	✓	–	–	✓	✓	–
	Higher Administrative Authority	-	✓	–	✓	✓	✓	✓	✓	✓	✓	✓	–	–	✓	✓	✓	✓	✓	–	–	✓
FF	Financial Capability	ROI	–	–	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	–	✓	✓	✓	–	✓	–
		Cost	–	–	✓	✓	–	–	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	–	–	–	✓
OF	Centralisation	-	–	–	✓	✓	✓	✓	✓	✓	–	✓	–	–	–	✓	✓	✓	✓	–	–	✓
	Managerial Capability	-	–	–	✓	✓	–	✓	✓	✓	–	✓	✓	✓	✓	✓	✓	–	✓	–	–	–
	Barriers	-	–	–	✓	✓	–	✓	✓	✓	✓	–	✓	✓	✓	✓	✓	✓	–	–	✓	–
	Benefits	-	–	–	–	✓	✓	✓	✓	✓	✓	–	✓	✓	✓	✓	✓	✓	–	–	✓	–
	Formalisation	-	–	–	✓	–	✓	✓	✓	✓	–	–	✓	–	✓	✓	✓	–	–	–	✓	✓
	Size	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	–	–	✓	✓	✓	–	–	–	–	✓

Table 4. Mapping Factors Influencing EAI Adoption on Different Phases of the Adoption Lifecycle in LGA_EAST_LONDON Departments

Table 4 displays varied results for the mapping of factors on adoption lifecycle phases by the interviewees. For example, in the case of project champion as a factor for EAI adoption in CICTD, the head of IT reported that:

> "*… involvement of the project champion is important in all the adoption lifecycle phases because project champions provide: (a) senior lead, (c) take responsibility and (c) supervise throughout any project …*"

The senior development support engineer reported that:

> "*… involvement of the project champion is vital only at the proposal phase because depending on the information from the project manager, the project champion is in a position whether to get investment from the senior management …*"

The service delivery manager for applications had a different opinion and said that:

> "*… from a 'driver force' point of view, the project champion typically influences on getting the project started, whilst in subsequent phases they can keep motivation going, especially where there a doubts raised about continuing, the conception, proposal and adoption phases usually deliver their required outcomes by process and not an individual's energy …*"

For CSCD, the project manager reported that:

> "*… project champion - a key motivator that influences on getting the project initiated, according to my knowledge, champion was not particularly involved in the conception and proposal phases during this project, whilst in the adoption decision phase the champion was indirectly involved merely to represent the department as the final decision to adopt was from the head of the department and other top management …*"

Whereas, for CSD, the web manager reported that:

> "*… project champion - a key motivator that influences on getting the project started, not particularly involved in the conception phases, whilst in subsequent phases they can keep motivation going until decision taken to adopt the solution …*"

The difference in opinion on mapping the factors can be attributed to the understanding, observation and participation of each interviewee in their respective EAI project. However, based on the empirical findings, the authors note that the identification of adoption lifecycle phases and mapping of factors on adoption lifecycle phases may support in better realising and understanding EAI adoption in the local government authorities. This is important as it may support the management decisions and actions during the introduction of EAI solutions. The analysis also reflects different ways of working and performing their functions even within the same organisation. This can be attributed to the staff members with different cultural backgrounds and different abilities of observing and understanding different phenomenon. Thus, the aforesaid empirical findings validate the mapping of factors on adoption lifecycle phases and fulfill the purpose of *research issue 2 – Mapping EAI Adoption Factors: Factors can influence EAI adoption in LGAs on different phases of the adoption lifecycle*.

9 CONCLUSION

This paper attempts to move the research a step forward to improve the decision-making process in LGAs while adopting EAI. In doing so, in section 2 the authors briefly discussed on how EAI may

benefit the organisations in overcoming their integration problems. Thereafter, section 3 explains the current research conducted on EAI adoption in the local government domain and highlighting factors influencing EAI adoption in LGAs. The factors presented in Table 1 are based on the EAI adoption model proposed in their earlier publications by (Kamal and Themistocleous, 2006, 2007). Yet again, the case study presented in this paper validates these factors and highlight their importance (Table 2). However, the main strength of this paper is investigating and proposing adoption lifecycle phases and validating these phases through the case study by mapping the factors (from Table 1) influencing EAI adoption on the adoption lifecycle phases. The case study conducted in LGA_EAST_LONDON departments validates the adoption lifecycle phases and the interviewees also highlighted which influenced their decision on the different adoption lifecycle phases (however, due to the length of the paper, authors just mentioned about the importance of project champion factor on adoption lifecycle phases with comments from the interviewees). The interviewees also mentioned four new phases that the authors explained as similar to the existing phases e.g. the head of IT and service delivery manager for applications from CICITD reported that before the motivation phase, they passed through another phase i.e. external driver and/or driving force phase for their EAI project. It can be said that these phases may exist in other LGAs, however the new phases need validation. The authors present the revised adoption lifecycle phases in Figure 2.

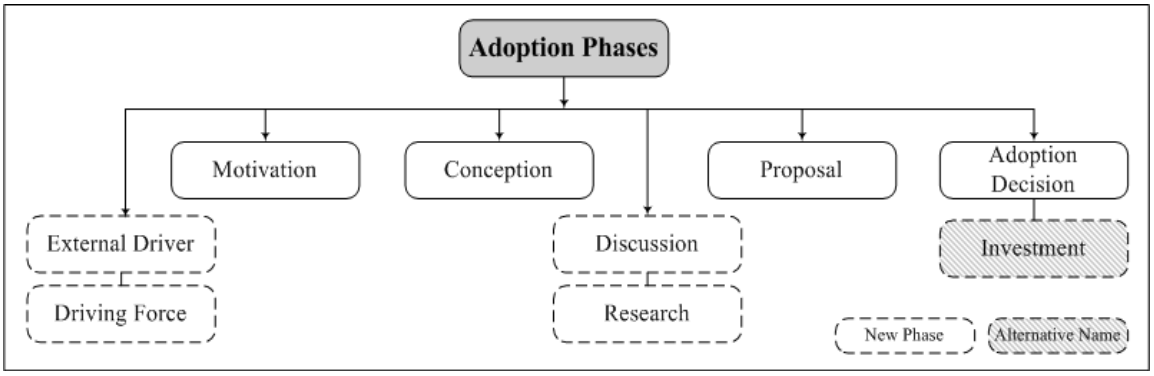

Figure 2: Revised Adoption Lifecycle Phases

The rationale for undertaking this research is that EAI is a relatively a new research area in the local government domain. Due to this, LGA officials are reluctant to make investments in EAI. This can be attributed to: (a) lack of skilled staff and disinclined to adopt new technologies, (b) lack of understanding and knowledge of EAI in the LGAs, (c) LGAs have been very slow or even unprepared for technological transformations (Devadoss *et al.*, 2002; Beaumaster, 2002), (d) LGAs are unable to react proactively as technologies constantly change and evolve around them (Beaumaster, 2002). Therefore, the process of identifying factor(s) influencing the decision-making process for EAI adoption on adoption lifecycle phases may assist LGAs while taking the decision for EAI adoption. The authors claim that the process of mapping the factors on adoption lifecycle phases has not been applied for the analysis of EAI adoption factors in LGAs. The authors suggest that it is mostly appropriate to use this process while adopting EAI, especially for high-risk EAI based project.

References

Agarwal, R. and Prasad, J. 1998. 'The antecedents and consequents of user perceptions in information technology adoption'. *Decision Support Systems*, 22(1): 15-29.

Akbulut, A. Y. 2002. 'An Investigation of the Factors that Influence e-Information Sharing Between State and Local Agencies'. *Eight Americas Conference on Information Systems*, USA, 2454-2460.

Bass, C., and Lee, J. M. 2002, 'Building a Business Case for EAI'. *EAI Journal*, 18-20.

Beath, C. M. 1991. 'Supporting the Information Technology Champion'. *MIS Quarterly*, 15(3): 355-372.

Beaumaster, S. 2002. 'Local Government IT implementation issues: A challenge for public administration'. *35th Annual Hawaii International Conference on System Sciences*, 1725-1734.

Beynon-Davies, P. 2005. 'Constructing Electronic Government: The Case of the UK Inland Revenue'. *International Journal of Information Management*, 25(1): 3-20.

Beynon-Davies, P., and Williams, M. D. 2003. 'Evaluating Electronic Local Government in the UK'. *Journal of Information Technology*, 18: 137-149.

Becker, S. N. and Whisler, T. L. 1967. 'The innovative organisation: a selective view of current theory and research'. *The Journal of Business*, 40(4): 462-469.

Bouchard, L. 1993. 'Decision criteria in the adoption of EDI'. *Proceedings of the 14th International Conference on Information Systems*, Orlando, Florida, USA, 365-376.

Bradford, M. and Florin, J. 2003. 'Examining the Role of Innovation Diffusion Factors on the Implementation Success of ERP Systems'. *International Journal of Accounting IS*, 4(3): 205-225.

Brudney, J. L., and Seldon, S. C. 1995. 'The Adoption of Innovation by Smaller Local Governments: The Case of Computer Technology'. *American Review of Public Administration*, 25(1): 71-87.

Carter, F. J. Jambulingham, T., Gupta, V. K. and Melone, N. 2001. 'Technological innovations: a framework for communicating diffusion effects'. *Information and Management*, 38: 277-287.

Chen, H. 2005. 'Adopting Emerging Integration Technologies in Organisations'. *PhD Thesis*, Department of Information Systems and Computing, Brunel University.

Danziger, J. N. and Kraemer, K. L, 1986. 'People and Computers: The Impacts of Computing on End Users in Organizations'. *New York*, NY: Columbia University Press.

Darmawan, I. G. N. 2001. 'Adoption and implementation of information technology in Bali's local government: a comparison between single level path analyses using PLSATH 3.01 and AMOS 4 and multilevel path analyses using MPLUS 2.01'. *International Education Journal*, 2(4): 100-23.

Devadoss, P. R., Pan, S.L., and Huang, J.C. 2002. 'Structural Analysis of E-Government Initiatives: A Case Study of SCO'. *Decision Support Systems*, 34: 253-269.

Dixon, R. D. 1999. 'The behavioural side of information technology'. *International Journal of Medical Informatics*, 56(1-3): 117-23.

Ebrahim, Z., and Irani, Z. 2005. 'E-Government Adoption: Architecture and Barriers'. *Business Process Management Journal*, 11(5): 589-611.

Ebrahim, Z., Irani, Z. and Sarmad, S. 2004. 'Factors Influencing the Adoption of E-Government in Public Sector', *European & Mediterranean Conference on Information Systems*, Tunis Tunisia.

Eisenhardt, K. M. 1989. 'Building Theories from Case Study Research'. *Academy of Management Review*, 14(4): 532-550.

Frambach, R. T. and Schillewaert, N. 2002. 'Organisational innovation adoption: a multi-level framework of determinants and opportunities for future research'. *Journal of Business Research*, 55(2): 163-76.

Gallivan, M. J. 2001. 'Organisational adoption and assimilation of complex technological innovations: development and application of a new framework'. *The DATABASE for Advances in Information Systems*, 32(3): 51-85.

Garfield, M. 2000. 'Critical success factors for the state telemedicine policy'. *6th Americas Conference on Information Systems*, Long Beach, California, USA, 1573-8.

Gil-García, J. R., and Pardo, T. A. 2005. 'E-Government Success Factors: Mapping practical tools to theoretical foundations'. *Government Information Quarterly*, 22(1): 87-216.

Gopalakrishnan, S. and Damanpour, F. 1997. 'A review of innovation research in economics, sociology and technology management'. *Omega*, 25(1): 15-28.

Hong, K. K., and Kim, Y. G. 2002. 'The Critical Success Factors for ERP Implementation: An Organisational Fit Perspective'. *Information & Management*, 40(1): 25-40.

Irani, Z., Sharif, A., Love, P.E.D. and Kahraman, C. 2002. 'Applying concepts of fuzzy cognitive mapping to model: the IT/IS investment evaluation process'. *International Journal of Production Economics.* 75, 199-211.

Janssen, M., and Cresswell, A. 2005. 'Enterprise Architecture Integration in E-Government'. *Proceedings of the 38th Hawaii International Conference on System Sciences*, Hawaii, 1-10.

Johannessen, J. A. 1994. 'IT and innovation: identifying critical innovation factors'. *Information Management & Computer Security*, 2(2): 4-9.

Kamal, M. M. and Themistocleous, M. 2007. 'Investigating EAI Adoption in LGAs: A Case Study Based Analysis'. *Thirteenth Americas Conference on Information Systems*, Keystone, Colorado, 1-13.

Kamal, M. M. and Themistocleous, M. 2006. 'A Conceptual Model for EAI Adoption in an E-Government Environment'. *European and Mediterranean Conference on Information Systems (EMCIS)*, Costa Blanca, Spain, 1-11.

Kamal, M. M. 2006. 'IT Innovation Adoption in the Government Sector: Identifying the Critical Success Factors'. *Journal of Enterprise Information Management*, 19(2): 192-222.

Karahanna, E., Straub, D.W. and Chervany, N.L. 1999. 'Information technology adoption across time: a cross-sectional comparison of pre-adoption and post-adoption beliefs'. *MIS Quarterly*, 23(2): 183-213.

Khoumbati, K. and Themistocleous, M. 2007. 'Application of fuzzy simulation for the evaluation of enterprise application integration in healthcare organisations', *Transforming Government: People, Process and Policy*, 1(3): 230-241.

Khoumbati, K. 2005. 'Evaluating the Adoption of Enterprise Application Integration in Healthcare Organisations'. *PhD Thesis*, Department of Information Systems and Computing, Brunel University.

Kim, H. J. and Bretschneider, S. 2004. 'Local Government Information Technology capacity: An Exploratory Theory', *Proceedings of the 37th Annual Hawaii International Conference on System Sciences*, 121-130.

Lam, W. 2005. 'Barriers to E-Government Integration, *Journal of Enterprise Information Management*, 18(5): 511-530.

Lam, W. and Shankararaman, V. (2004). 'An Enterprise Application Integration Methodology', *IT Professionals*, 6(1): 40-48.

Lee, C. S., Chandrasekaran, R., and Thomas, D. 2003. 'Examining IT Usage Across Different Hierarchical Levels in Organisations: A Study of Organizational, Environmental, and IT Factors'. *Proceedings of the Ninth Americas Conference on Information Systems*, 1259-1269.

Linthicum, D. 2000. '*Enterprise Application Integration*', Massachusetts, USA, Addison-Wesley.

Mantzana, V. G. 2006. 'Investigating The Adoption Of Enterprise Application Integration In Healthcare Organisations Using An Actor-Oriented Approach'. *PhD Thesis*, Department of Information Systems and Computing, Brunel University.

McIvor, R., McHugh, M. and Cadden, C. 2002. 'Internet Technologies Supporting Transparency in the Public Sector', *The International Journal of Public Sector Management*, 15(3): 170-187.

Melitski, J. 2003. 'Capacity and E-Government Performance'. *Public Performance and Management Review*, 26(4): 376-390.

Miles, M. B. and Huberman, A. M. 1994. 'Qualitative Data Analysis: An Expanded Sourcebook'. *SAGE Publications*, Newbury Park, California, USA.

Moon, J., and Bretschneider, S. 1997. 'Can State Government Action Affect Innovation and Diffusion'. *Technology Forecasting and Social Change*, 54: 57-77.

Norris, D. F. 1999. 'Leading Edge Information Technologies and their Adoption: Lessons from US Cities'. *Hershey*, PA: Idea Group Publishing.

Nye, Jr. J. 1999. 'IT and Democratic Governance: Governance in Networked World'. *Hollins*, NH, 1-18

Paul J-H. H., Chau, P. Y. K. and Sheng, O. R. L. 2000. 'Investigation of factors affecting healthcare organization's adoption of telemedicine technology', *Proceedings of the 33rd Annual Hawaii International Conference on Systems Sciences*, 1-10.

Perry, J. L., and Danzinger, J. N. 1980. 'The Adoptability of Innovation: An Empirical Assessment of Computer Applications in Local Governments'. *Administration and Society*, 11(4): 461-492.

Prescott, M. B., and Conger, S. A. 1995. 'Information Technology Innovations: A Classification by IT Locus of Impact and Research Approach'. *The DATA BASE for Advances in Information Systems*, 26(2/3): 20-41.

Reiersgaard, N., Salvesen, H., Nordheim, S. and Päivärinta, T. 2005. 'EAI Implementation Project and Shakedown: An Exploratory Case Study', *Proceedings of the 38th Annual Hawaii International Conference on System Sciences (HICSS'05)*, 1-10.

Rogers, E. M. 1995. 'Diffusion of Innovations'. New York, The Free Press.

Ruh, W., Maginnis, F., and Brown, W. 2001. 'Enterpriser Application Integration'. *A Wiley Tech Brief*, New York, USA, Wiley John Wiley & Sons Inc.

Sanchez, E., Beery, D., and Shehab, J. 2005. 'EAI Systems Bring IT Together'. *Network Computing*.

Senyucel, Z. 2005. 'Towards Successful e-Government Facilitation in UK Local Authorities'. *e-Government Workshop*, 1-16.

Serian, D. 2002. 'Middleware and Enterprise Application Integration'. Springer Verlag, London.

Signore, O., Chesi, F., and Pallotti, M. 2005. 'E-Government: Challenges and Opportunities'. *CMG Italy - XIX Annual Conference*, Florence, Italy.

Somers, T. M. and Nelson, K. 2001. 'The impact of critical success factors across the stages of enterprise resource planning implementations', *Proceedings of the 34th Annual Hawaii International Conference on System Sciences*, 1-10.

Themistocleous, M. and Irani, Z. 2006. 'Towards a Methodology for the Development of Integrated IT Infrastructures', In Sprague, R. J. (Eds), *Proceedings of the 39th Annual Hawaii International Conference on System Sciences (HICSS'06)*. Hawaii, USA, IEEE Computer Society, Los Alamitos, California, USA, [CD Proceedings], 4-7.

Themistocleous, M., Irani, Z. and Love, P. E. D. 2005. 'Developing E-Government Integrated Infrastructures: A Case Study'. *Proceedings of the 38th Annual Hawaii International Conference on System Sciences* - Big Island, Hawaii, 1-10.

Themistocleous, M., Irani, Z. and Kuljis, J. 2004. 'Extending the Information System Lifecycle through Enterprise Application Integration: A Case Study Experience'. *37th Annual Hawaii International Conference on System Sciences (HICSS'04) -Track 8*, Big Island, Hawaii, IEEE, 1-8.

Themistocleous, M. 2004. 'Justifying the decisions for EAI implementations: A validated proposition of influential factors'. *Journal of Enterprise Information Management*, 17(2): 85-104.

Themistocleous, M., and Irani, Z. 2002. 'Evaluating and Adopting Application Integration: The Case of a Multinational Petroleum Company'. *35th Hawaii International Conference on System Sciences*, IEEE, 3715-3723.

Themistocleous, M., and Irani, Z. 2001. 'Benchmarking the Benefits and Barriers of Application Integration'. *Benchmarking An International Journal*, 8(4): 317-331.

Zahavi, R. 1999. '*Enterprise Application Integration with Corba*', New York, USA, John Wiley and Sons Inc.