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INVESTIGATING ENTERPRISE APPLICATION INTEGRATION (EAI) ADOPTION IN THE LOCAL GOVERNMENT AUTHORITIES (LGAs)

Thesis submitted for the degree of Doctor of Philosophy by

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بِسْمِ اللّهِ الرَّحْمٰنِ الرَّحِيْمِ

يَا أَيُّهَا الَّذِيْنَ آمَنُو اْ اسْتَعِيْنُو اْ بِالصَّبْرِ وَالصَّلاَةِ إِنَّ اللّهَ مَعَ الصَّابِرِيْنَ o

O you who believe! Seek assistance through patience and prayer; surely Allah is with the patient.
[*Surah Al-Baqarah: Ayah 153*]

S

PhD Summary

This thesis focuses on investigating Enterprise Application Integration (EAI) adoption in the Local Government Authorities (LGAs). EAI has emerged to support organisations to integrate their Information Technology (IT) infrastructures and deliver high quality of services. Despite the fact that several private and public organisations have adopted EAI, its application in LGAs is limited. This may illustrate that LGAs develop EAI solutions at a slower pace and they can be characterised as a laggard comparing to other sectors. The small number of EAI applications in LGAs has resulted in limited research in this area with many issues, like its adoption requiring further investigation. Literature indicates various models that analyse various factors influencing EAI adoption in the private and public domain. However, the applicability and validity of these models is arguable and under research in LGAs, as these were proposed to support the decision-making process in other sectors and not in LGAs. To the best of the researcher's knowledge, none of the existing EAI adoption models explored the importance of factors during different phases of the adoption lifecycle. Notwithstanding, the implications of EAI have yet to be assessed, leaving scope for timeliness and novel research. Thus, the researcher demonstrates that it is of high importance to investigate this area within LGAs and result in research that contributes towards successful EAI adoption.

This thesis makes a step forward and contributes to the body of knowledge as it: investigates factors influencing the decision making process for EAI adoption in LGAs (Figure 3.2), analyses and proposes the adoption lifecycle phases (Figure 3.3), maps and prioritises the importance of EAI adoption factors on different phases of the adoption lifecycle (Chapter 5 for empirical results) and in doing so, to propose a model for EAI adoption in LGAs (Figure 3.7). The researcher claims that such an EAI adoption process in LGAs is significant and novel as: it extends established norms for EAI adoption, by including Analytical Hierarchy Process (AHP) technique for prioritising the importance of factors, thus, enabling LGAs to produce more robust proposals for EAI adoption. The researcher discusses on EAI adoption by using a qualitative, interpretive, multiple case study research strategy. Findings from three case organisations exhibit that such an approach contributes towards more robust decisions for EAI adoption and indicates that it is acceptable by the case organisations. Despite these results cannot be generalised, yet they can allow others to relate their views with the ones reported in this thesis. This thesis proposes, tests and presents a novel model for EAI adoption in LGAs and contributes to the body of knowledge by extending the literature.

A

Acknowledgement

Research activity is collaborative in nature. The research presented in this thesis is no exception and the support of a number of individuals is gratefully acknowledged. My thanks can be expressed in terms of remarkable supervision, financial, emotional and empirical support. However, such support acted as a mediator as I strongly believe and have full faith that ALLAH (The Almighty God) assisted me at *every* stage throughout my life, right the way through my doctoral studies and shall indeed guide and bless me with the best in the future.

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D

Dedication

محترم والد جناب محمد منیر مرزا

والدہ محترمہ نسرین اختر (مرحومہ) [٦ ستمبر ١٩٤٩ – ٢٧ جون ١٩٩٦]

محترم جناب احمد حسن حامد

محترمہ عزرا حامد

زوجا محترمہ رابعہ کمال اور صاحبزادی ھُدہ کمال

اور میرا عزیز خاندان

D

Declarations

This thesis gives an account of the research undertaken by Muhammad Mustafa Kamal. Some of the material displayed herein has already been published, is accepted and yet to be published or is under review in the form of the following publications:

Journal Papers ***Published/Accepted for Publication***

[J1] **Kamal, M. M.** 2006. 'IT Innovation Adoption in the Government Sector: Identifying the Critical Success Factors', *Enterprise Information Management Journal*, **19**(2): 192-222.

Journal Papers ***Under Review***

[J2] **Kamal, M. M.** and Themistocleous, M. 2008. 'Prioritising the Importance of Factors Influencing Enterprise Application Integration (EAI) Adoption in the Local Government Authorities (LGAs) using the AHP Technique', *Enterprise Information Management Journal.*

[J1] **Kamal, M. M.** and Themistocleous, M. 2008. 'Enterprise Application Integration (EAI) Adoption in the Local Government Authorities (LGAs)', *International Journal of Technology Management.*

Conference Papers ***Published/Accepted for Publication***

[C8] **Kamal, M. M.**, Themistocleous, M. and Elliman, T. 2008. 'Extending IT Infrastructures in the Local Government Authorities through Enterprise Application Integration', *Proceedings of the 14th Americas Conference on Information Systems – AMCIS'08*, Toronto, Canada.

[C7] **Kamal, M. M.**, Themistocleous, M. and Elliman, T. 2008. 'Mapping Factors Influencing EAI Adoption in the Local Government Authorities on Different Phases of the Adoption Lifecycle', *European and Mediterranean Conference on Information Systems*, Dubai, UAE.

[C6] Themistocleous, M., Serrano, A. and **Kamal, M. M.** 2008. 'Training Senior Employees for ICT Skills Enhancement through "REFOCUS" The European Project', *European and Mediterranean Conference on Information Systems*, Dubai, UAE.

[C5] **Kamal, M. M.** and Themistocleous, M. 2007. 'Investigating EAI Adoption in LGAs: A Case Study Based Analysis', *Proceedings of the 13th Americas Conference on Information Systems – AMCIS'07*, Keystone, Colorado, USA, pp. 1-13 [CD PROCEEDINGS].

[C4] **Kamal, M. M.** and Themistocleous, M. 2006. 'Evaluating EAI Adoption in an E-Government Environment', *European and Mediterranean Conference on Information Systems*, Alicante, Spain, pp. 1-11.

[C3] **Kamal, M. M.** 2004. 'EAI Integrating CRM Applications in the Government Sector', *Proceedings of the 6th International Conference on Information Integration and Web-based Applications & Services,* Jakarta, Indonesia, pp. 383-393.

[C2] **Kamal, M. M.** 2004. 'IT Innovation Adoption in the Government Sector: Identifying the Critical Success Factors', *The 2004 International Research Conference on Innovations in Information Technology*, Dubai, UAE, pp. 1-16.

[C1] **Kamal, M. M.** 2004. 'Integrating E-Government through EAI', *Proceedings of the 10th* Americas *Conference on Information Systems – AMCIS'04,* New York, USA, pp. 1143-1149.

Book Chapter ***Published/Accepted for Publication***

[BC2] **Kamal, M. M.** and Themistocleous, M. 2008. 'Investigating Enterprise Application Integration Adoption in the Local Government Authorities (LGAs)', Strategies for Local E-Government Adoption and Implementation: Comparative Studies.

[BC1] **Kamal, M. M.,** Themistocleous, M. and Morabito, V. 2008. 'Extending E-Government Infrastructures through Enterprise Application Integration', Evaluating Information Systems, Butterworth-Heinemann, Elsevier Limited.

Book Chapter ***Under Review***

[BC1] **Kamal, M. M.** and Themistocleous, M. 2008. 'Mapping the Factors Influencing Enterprise Application Integration Adoption on Different Phases of the Adoption Lifecycle in the Local Government Authorities', ICT-Enabled Transformation Government: A Global Perspective.

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Chapter 1: Introduction to the Research Area

Summary

Literature reports that the Local Government Authorities (LGAs) have problems in meeting citizens' demands. This may be attributed to the limitations of LGA's Information Technology (IT) infrastructures that are not integrated and do not allow them to deliver end-to-end integrated services. During the recent years, Enterprise Application Integration (EAI) has emerged to support organisations to integrate their IT infrastructures and deliver high quality of services. Despite the fact that EAI has been adopted by many other types of organisations (e.g. healthcare sector, private companies), its application in LGAs is limited. It is therefore essential for LGAs to realise the importance of EAI and speed up their decision-making process to adopt it.

The normative literature well investigates and analyses EAI adoption. However, the literature on the adoption of EAI in LGAs is limited, as local government authorities may be characterised as laggards. As a result, further research is required to support the decision-making process in LGAs when taking decisions for EAI adoption. Although models related to EAI adoption have been reported in the literature, the applicability and validity of these models in the area of LGAs is arguable and under research. The reason is that these models were proposed to support the decision-making process in private or healthcare sectors and not in LGAs. 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, literature indicates that one set of factors is used to support EAI adoption in Small and Medium Enterprises (SMEs) and another in large organisations. In addition, there are differences among influential factors that are used in private sector and healthcare organisations. Despite that these models have several common factors there is no specific model that investigates EAI adoption in LGAs. Moreover, the decision-making process in LGAs differs a lot from other private organisations.

All the aforesaid issues are discussed in this chapter with Section 1.1 explaining the need for structural changes within LGAs and discusses on several problems that exist in LGAs.

Thereafter, Section 1.2 illustrates EAI and its importance in LGAs. The aim and objectives of this research are defined, with an outline of the thesis presented and summarising the conclusions in Sections 1.3, 1.4 and 1.5 respectively.

1.1 Background to the Research Problem

During the last decades, several LGAs have widely focused on the use of Information Systems (IS) to overcome their organisational problems and automate their business processes and functions (Grimsley and Meehan, 2007; Irani *et al.,* 2005). LGAs focused on IS to provide direct support to meet citizens' needs including housing, social services, and the management of a complex service infrastructure that supports communities and businesses (Johnson and King, 2005). However, IS developments within LGAs have resulted in non-integrated IT infrastructures (Lam, 2005; Beaumaster, 2002). The reason is that each LGA autonomously made its own IT operation decisions based on its needs (Janssen and Cresswell, 2005; Di Natale *et al.*, 2003; Aldrich *et al.,* 2002). Additionally, there was rarely a single approach for developing IS, as organisations have developed their applications without a common architectural planning (Markus and Tanis, 1999). Moreover, each LGA displays differences in the way: (a) their business processes are implemented to provide citizen services, and (b) makes its decisions that differs a lot from other private organisations (Johnson and King, 2005; Ward and Mitchell, 2004). Such theorised evidences illustrate that LGAs operate and function independently and do not share information and functionality with other LGAs (Gortmaker and Janssen 2004; Ralphs and Wyatt, 1998).

Such aforesaid concerns have resulted in several problems that have influenced the decision-making process in LGAs. For example, Beynon-Davies and Williams (2003) report that within LGAs there is not enough emphasis on the re-engineering of legacy business processes and applications. The reason is that legacy business processes and applications have been developed over several years to serve their core processing needs and government officials are reluctant to change their operational procedures (Lam, 2005). Furthermore, McIvor *et al.,* (2002) report that the inherent design of many legacy applications was as standalone, typically mainframe-based applications, rather than as network-integrated applications. The reluctance in government officials to bring change in their operational practices and availability of non-integrated legacy applications has resulted in poor citizen service provisioning and making decision-making process more complex (Lam, 2005; McIvor *et al.,* 2002). Thus, the integration of legacy business processes and applications is required to support coordination within LGAs, enhance the decision-making process and provide better services to citizens (Janssen and Cresswell, 2005; McIvor *et al.,* 2002).

While adopting new IT solutions, a major concern for LGAs' management is the investment decision associated with the change in organisation and their IT infrastructure (Signore *et al.*, 2005; Beaumaster, 2002). The reason is that LGAs lack sufficient amount of money for their IT infrastructure (Ward and Mitchell, 2004). Wagnar and Antonucci (2004) support that LGAs' budgets are often reduced and sometimes allocated with appropriations. Lam (2005) and McIvor *et al.*, (2002) also report that government organisations face difficulties in obtaining the level of financial support requested, especially if grant is drawn from a funding pool that is meant to serve multiple initiatives. Therefore, LGAs are seeking for integration solutions that are cost effective and as a result provide better services to their citizens.

Another problem notable is with the electronic Government (e-Government) policies that are still evolving and are in a state of change (Lam, 2005). In this context, the central government plays a pivotal role in defining policies for citizen privacy and security, which can be interpreted by LGAs in relation to their e-Government projects. Signore *et al.*, (2005) argues that citizens' concerns on privacy and confidentiality of the personal data have been a critical obstacle in implementing e-Government projects. Tillman (2003) also reports that concerns over citizen privacy continue to be a problem in e-Government discipline, whereas Lam (2005) identified citizen privacy as a barrier to integrating e-Government. Lam (2005) also supports that the lack of clarity in the privacy policies among LGAs is a major problem. The reason is that questions regarding: (a) why data is being collected, (b) how it will be used and secured, and (c) with whom it will be shared, require the establishment of clear policies with respect to citizen data privacy and security. In the absence of such policies, decision-making to achieve integrated e-Government may become stagnated (Signore *et al.* 2005; Lam, 2005).

Moreover, a long-term government sector concern is the need for efficient and effective application integration (Beynon-Davies and Williams, 2003). Janssen and Cresswell (2005) report that service provisioning is likely to fail if the information systems within LGAs that need to work together to provide a service are not integrated. Integration problems are founded in the highly fragmented IS within LGAs (Lam, 2005). Such IS were often based on different hardware configurations, functioning under different operating systems, employing distinct database technologies and programming languages (Peristera and Tarabanis, 2000). According to Allen *et al.*, (2001) existing IS are typically built using architectures that do not readily support enterprise-wide integration, thus requiring major efforts to take decision to develop new architectures and systems to implement e-Government.

In addition to aforesaid problems, literature also indicates several differences in the decision-making process within LGAs and other private organisations (Ward and Mitchell, 2004). The rationale is that LGAs are complex organisations and are managed by the consent and rules set by the central government. They are influenced by other government authorities and ministries, and their IS adoption involve distributed decision-making based on a division of control and powers (Worrall, 1994). Additionally, LGAs seek guidance from central government on how to translate their e-Government vision into more explicit specifications for e-Government service provisioning (Lam, 2005). Conversely, private organisations have direct and undivided power over decisions and flexible management style with inter-departmental teams working in central coordination (Ward and Mitchell, 2004). This distinction illustrates that LGAs have a bureaucratic nature and are committed to outdated cultural values. Such characteristics emphasise risk aversion and insist that structures enhance control rather than connected thinking with silos in LGAs, let alone between them (Janssen and Cresswell, 2003).

Thus, all the aforementioned problems illustrate that there is a need for LGAs to: (a) undergo structural and operational changes to accommodate changing citizen needs, (b) enhance decision-making process, (c) adopt cost-effective integration solutions, (d) integrate their autonomous information systems, and (e) persistent business process transformation.

1.2 Enterprise Application Integration and its Significance in LGAs

Enterprise application integration has emerged to overcome integration problems at all levels (e.g. data, object and process). According to Linthicum (2000) EAI is the:

> "*Unrestricted sharing of information between two or more enterprise applications. A set of technologies that allow the movement and exchange of information between different applications and business processes within and between organisations.*"
>
> *Linthicum (2000, p.354)*

EAI evolved to overcome the limitations of Enterprise Resource Planning (ERP) and other packaged and legacy systems through providing an integrated organisational infrastructure (Janssen and Cresswell, 2005; Lam, 2005; Volkof *et al.*, 2005). It provides substantial benefits (e.g. assist in business process integration, support in collaborative decision-making, results in reduced integration cost, securing and providing privacy of citizens' data, and results in developing flexible, and maintainable integrated IT infrastructures). Sharif *et al.*, (2004) reports that EAI is typically a backroom technology as it supports the processes within an organisation and is not directly visible to the general staff, citizens and stakeholders. It emerged as a solution to intra- and inter-organisational systems and business process integration (Lam, 2005; Volkof *et al.,* 2005). For many reasons, EAI results in providing organised business process, achieves Return on Investment (ROI), increases collaboration among partners, achieves process integration and reduces cost (Irani *et al.*, 2003).

In the context of the local government authorities, EAI represents an attractive proposition to LGAs, since EAI offers the opportunity to leverage the systems into a seamless chain of processes and present a unified view of their information (Janssen and Cresswell 2005; Ruh *et al.* 2000). When such leveraging and presentation occurs, LGAs may capitalise on their opportunities offered by LGA initiatives (e.g. e-Government) because then they may efficiently interact with their citizens and other stakeholders on a consistent basis (Janssen and Cresswell, 2005). Nonetheless, based on the critical review of the normative literature, EAI adoption has not been widely investigated in LGAs, thus research around it remains limited. Including among others the reasons may be that: (a) LGAs adopt new IT reactively compared to private organisations (Themistocleous *et al.,* 2004), (b) lack of skilled staff and reluctant to adopt new technologies (Janssen and Cresswell, 2005) and (c) lack of understanding and knowledge of EAI in the local government authorities (Lam, 2005; Janssen and Cresswell, 2005).

There exist few EAI adoption models theorised in the normative literature such as in: (a) healthcare organisations (Mantzana, 2006; Khoumbati, 2005), (b) SMEs and large organisations (Chen, 2005), and (c) multinational organisations (Themistocleous, 2004). These models are not generic and their validity and applicability within LGAs is questionable. Themistocleous (2004) is among the first who studied the area of EAI adoption and proposed a model that explains the main factors that influence EAI adoption in multinational organisations. In an attempt to study EAI adoption in healthcare, Khoumbati (2005) adapted Themistocleous (2004) EAI adoption model by revising it. Between the two models there are differences indicating that the influential factors for EAI adoption in healthcare are not exactly the same as those in multinational organisations. For instance, competitive pressure is proved to be an influential factor for private companies and not for healthcare organisations.

Mantzana (2006) extended the research area in healthcare sector by identifying the healthcare actors involved in the EAI adoption process. Moreover, she identified the causal relationships among the healthcare actors and factors (Khoumbati, 2005) that influence EAI adoption. Similarly, Chen (2005) examined the adoption of emerging integration technologies in SMEs and proposed a conceptual model for the adoption of integration technologies based on comparative analysis between SMEs and large organisations. Chen's (2005) model differs from those proposed by Mantzana (2006), Khoumbati (2005) and Themistocleous (2004). Therefore, these models may provide some understanding regarding EAI adoption in LGAs, but not all of their factors can be seen as influential for LGAs. In this context, the overall applicability of all theorised EAI adoption models may not provide the same outcome in LGAs. As a result, LGAs seek answers for the effect of EAI adoption, as it may assist them in understanding EAI technological benefits, barriers and costs.

1.3 Research Aim and Objectives

The research reported in this thesis, is based on the underlying principle that complex decision-making process and lack of common IT infrastructures in LGAs has resulted in a plethora of heterogeneous systems that provide information and services in a confined manner (Lam, 2005; Gamper and Augsten 2003; Di Natale *et al.,* 2003). Thus, there is a need to bridge the systems together to improve the delivery of services to citizens. As a result, the amount of data duplication errors caused by non-integrated systems will be significantly decreased and improve decision-making process. Literature reports that EAI can be used to create an integrated infrastructure in LGAs (Lam, 2005; Themistocleous *et al.,* 2005). In addition, the literature (see Chapter 2) suggests that EAI can support LGAs to improve their business processes and decision-making (Themistocleous *et al.,* 2004). Thus, EAI might be considered as an integration solution for LGAs in integrating their information systems and improving the decision-making process.

To better understand the issues around EAI, LGAs may be benefited from a frame of reference to support their integration goals. This frame of reference will provide with better assistance to LGAs to understand the effect of EAI adoption on their performance and structure, before proceeding with their investment strategy. The proposed frame of reference will be translated into a model that may assist the local government authorities in supporting effective decision-making for EAI investment. As a result, the aim of this thesis is to:

> "*Investigate enterprise application integration adoption in the local government authorities. In doing so, resulting in the development of a model that may assist the local government authorities in their decision making process for EAI adoption.*"

The researcher highlights the *need* for a framework of relevant factors for EAI adoption. Despite few factors (e.g. EAI benefits, barriers and costs) are well analysed in the normative literature, there is a *need* to understand, assess and explain them in the context of LGAs. The framework of factors can be translated into a model that may assist the LGA officials in their decision-making process for EAI adoption. Additionally, to enhance the decision-making process for EAI adoption, the researcher attempts to: (a) identify different adoption lifecycle phases, (b) which factor(s) may influence EAI adoption at each phase and (c) prioritising the importance of EAI adoption factors at each phase of the adoption lifecycle. This will provide guidelines for LGA decision makers while making the decision for EAI adoption.

The objectives of this PhD thesis are outlined as below,

- ***Objective 1:*** To critically review the EAI literature and understand the area with a particular focus on the local government authorities.

- ***Objective 2:*** To investigate and evaluate factors influencing EAI adoption in the local government authorities.

- ***Objective 3:*** To investigate the importance of the influential factors that can support the overall decision-making process for EAI adoption in the local government authorities.

- ***Objective 4:*** To develop and propose a model for EAI adoption in the local government authorities.

- ***Objective 5:*** To test and evaluate the model, within practical arena and provide a novel contribution to the domain of local government authorities and EAI.

1.4 Thesis Outline

The structure of this PhD thesis follows the methodology described by Phillips and Pugh (1994) and consists of four elements namely: (a) background theory; (b) focal theory; (c) data theory and (d) novel contribution. Background theory focuses on discussing the research area (see Chapter 1), assessing the field of research and identifying the problem domain (see Chapter 2). The second element of the thesis (focal theory) deals with generating a conceptual model. This is explained and discussed in Chapter 3. Data theory addresses issues such as: (a) the most appropriate epistemological stance to adopt; (b) the development of a suitable research methodology and, (c) the conditions affecting the choice of research strategy. These issues are discussed in Chapter 4 of this thesis. In addition, data theory deals with the data collection process and analysis, which is reported in Chapter 5. The fourth element (novel contribution) is concerned with aligning the importance of the thesis, to the development of the discipline being researched (see Chapters 6). In Chapter 7, the researcher has summarised the research presented in this thesis with a brief outline of contributions and discusses the potential areas for further research. This thesis is composed of seven chapters, each providing an understanding to various issues viewed to be critical for this research. The thesis outline is illustrated in Figure 1.1 and is explained in the following paragraphs.

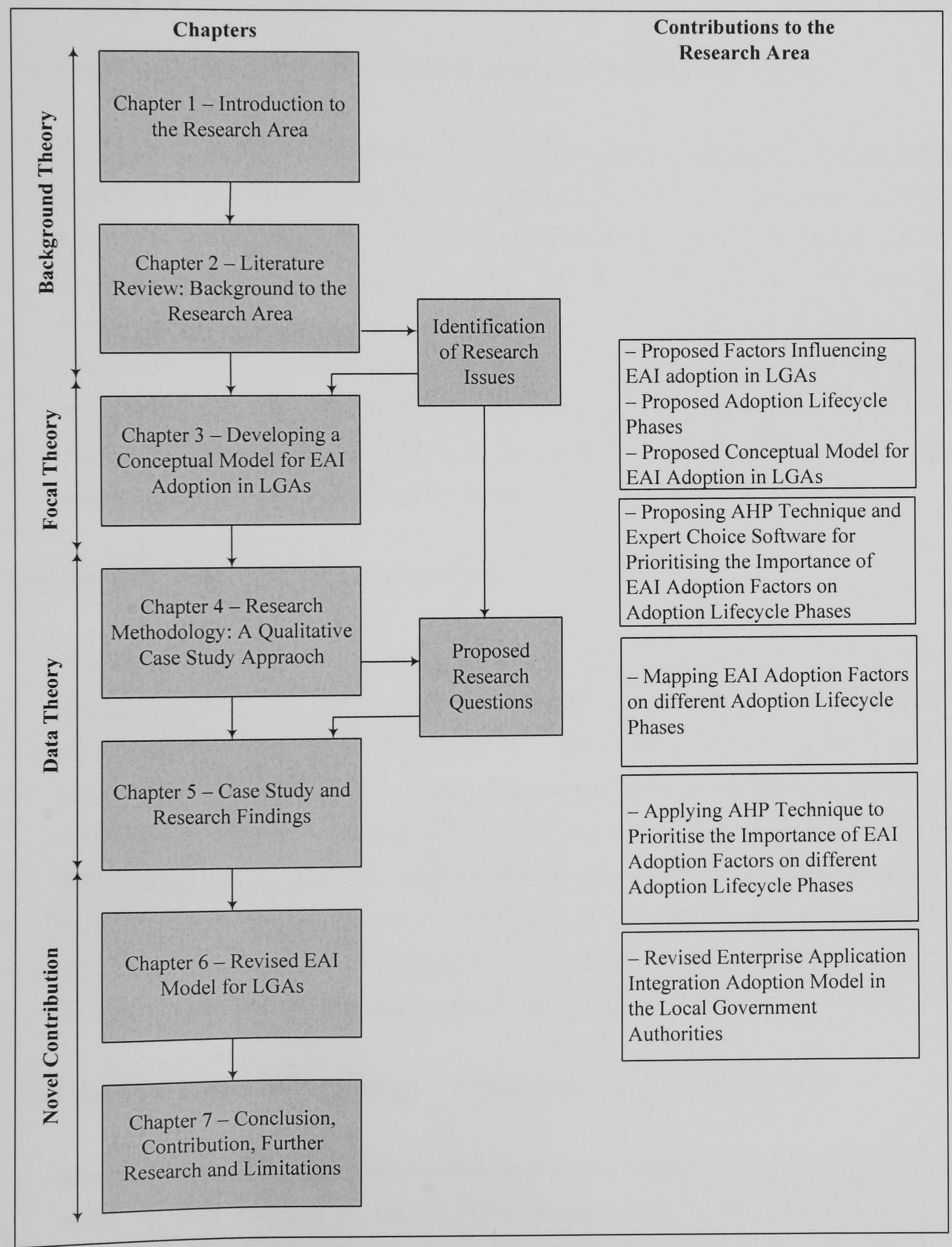

Figure 1.1: Thesis Outline

- **Chapter 1: Introduction to the Research Area**

Chapter 1 begins by providing an introduction to the main issues this research will address by focusing on EAI and LGAs. The issues under research focus on the need to integrate the IS in a more flexible and maintainable way and improve the decision making process in LGAs. Thereafter, the aim and objectives are stated with an outline of the thesis (Figure 1.1) and thesis story through tables and figures (Figure 1.2) in the end.

- **Chapter 2: Literature Review – Critical Analysis of the Research Area**

Having provided a brief introduction to the research area and established the scope, the thesis begins to review the literature on LGAs and EAI. Initially, this chapter critically reviews IT adoption literature in LGAs and then summarises the limitations of IT infrastructure in LGAs (Figure 2.1). Then establishes the scope on EAI area by discussing on: (a) the business and technical perspectives and (b) current research conducted on EAI adoption in private and public domain, (c) current research conducted on EAI adoption in LGAs. Finally, highlighting the current research conducted on adoption phases, mapping of factors and prioritisation of EAI adoption factors with research issues for further investigation (Section 2.5).

- **Chapter 3: Developing a Conceptual Model – EAI Adoption in LGAs**

Chapter 3 proposes a conceptual model for EAI adoption in LGAs (Figure 3.7). The proposed model can be used as a decision-making tool and thus, support management when taking decisions regarding EAI adoption. Additionally, the model can be used by practitioners and researchers to analyse and understand EAI adoption in LGAs. In addition, this chapter investigates and proposes factors influencing EAI adoption in LGAs (Figure 3.2), identifies the adoption lifecycle phases (Figure 3.3), discusses on the mapping of EAI adoption factors at each phase of the adoption lifecycle and lastly, presents the significance of prioritising the importance of factors on different phases of the adoption lifecycle and proposing research issues for further investigation (Table 3.3).

- **Chapter 4: Research Methodology – A Qualitative Case Study Approach**

Chapter 2 is setting the background of this research and Chapter 3 proposes a conceptual model for EAI adoption in LGAs. These chapters have helped the researcher to understand and identify research issues for further investigation. To undertake the research that focuses on these issues, a research methodology is followed to test the proposed conceptual model in the practical arena. The reasoning behind the selection of a specific research methodology is stated in Chapter 4. The inherent problems within the various research philosophies are stated and the suitability to this research is provided.

- **Chapter 5: Case Study and Research Findings**

Having achieved an understanding of all the relevant issues for this research, the thesis then provides a description of the case studies conducted in three LGAs in the United Kingdom (UK). Chapter 5 provides a background to these LGAs and describes and analyses the main issues including: (a) existing IT infrastructure, (b) motivations to EAI adoption, (c) EAI adoption process, (d) pilot case study/real projects, (e) EAI adoption factors, (f) adoption lifecycle phases, (g) mapping EAI adoption factors and (h) prioritising EAI adoption factors via Analytical Hierarchy Process (AHP) technique.

- **Chapter 6: Revised EAI Adoption Model in LGAs**

Based on the case studies and research findings in the previous chapter, this chapter briefly outlines the current research, illustrates the lessons learnt from the case organisations and (a) revising the existing factors influencing the decision making process for EAI adoption in the case organisations, (b) describing new factors extracted from the empirical findings, (c) revising existing and describing new adoption lifecycle phases. In doing so, satisfying the aim of this thesis by offering the decision-makers and researchers a revised model for enterprise application integration adoption in LGAs.

- **Chapter 7: Conclusions, Contribution, Further Research and Limitations**

Chapter 7 summarises the research presented in this thesis. Based on the research presented in this thesis, the researcher describes the aim and objectives the thesis met and main findings from the over all thesis. Thereafter, the statement of the contributions and research novel is presented. To conclude the chapter and this thesis, the researcher provides the major conclusions regarding the possible limitations of the research and describes the potential areas of further research.

In Figure 1.1, the researcher presented the structure of this thesis. To better explain the structure, the researcher presents the story of this thesis in Figure 1.2 that is based on the use of the main figures and tables presented herein.

Tables	Key Themes Presented in each Table or Figure	Figures
—	Thesis Outline	Figure 1.1
Table 2.1	IT Adoption Timeline / Limitations of IT Infrastructures in LGAs	Figure 2.1
Table 2.2	Specific and Common Factors / Studies on EAI Adoption	Figure 2.5
Table 2.3	Highlighting the Research Issues	—
Table 3.1	Categories of Factors / Proposed Factors for EAI Adoption in LGAs	Figure 3.2
Table 3.2	Literature Findings on Adoption Phases / Proposed Adoption Lifecycle Phases	Figure 3.3
—	Abstract Model for EAI Adoption in LGAs	Figure 3.6
—	Proposed Conceptual Model for EAI Adoption in LGAs	Figure 3.7
Table 3.3	Proposed Research Issues for Further Investigation	—
Table 4.8	Questions addressed by the Empirical Enquiry / Empirical Research Framework	Figure 4.1
Table 5.2	Empirical Investigation of the Research Issues	—
Tables 6.1, 6.2, 6.3, 6.4 and 6.5	Analysis of Factors / Revised Factors	Figure 6.1
Table 6.27	Classification of Existing EAI Adoption Factors based on their Importance	—
—	Revised Adoption Lifecycle Phases	Figure 6.2
—	Revised EAI Adoption Model in the Local Government Authorities	Figure 6.3
Table 7.1	Meeting the Aim and Objectives of this Thesis	—
Table 7.2	Research Novelty and Contribution	—

Figure 1.2: Thesis Story through Tables and Figures

1.5 Conclusion

Based on the research accomplished within this chapter, it can be said that managing information technology is a challenge under any set of circumstances. Creating and managing an integrated IT infrastructure with seamless interoperability requires foresight, comprehensive IT knowledge, adequate time, financial commitments, and qualified resources. Although these requirements may seem difficult to satisfy, the value of a well planned, flexible and reliable infrastructure is paramount. Without it, performance degradation, security exposures, data privacy issues and system failures will become increasingly common and damage the chances of the very initiatives that the governments want to achieve. Less obvious, but equally damaging, will be an environment where the applications and IT infrastructures have insufficient flexibility to keep up with the desired pace of innovation.

For this reason, the decision makers across the local government authorities need to increasingly prioritise their IT infrastructure planning and deployment in order to fully realise their initiatives. However, LGAs need to be able to build an infrastructure that meets the foremost important issue of information systems integration, flexibility, scalability, interoperability and reliability requirements for the future, without being locked in to a single technology base that limits the incorporation of new, more cost effective technologies. EAI attempts to address the organisational integration problems from both technical and business perspective. It combines a variety of integration technologies to build a centralised integration infrastructure. EAI addresses the need to integrate both intra and inter-organisational systems through incorporating functionality from different applications.

There is an increasing demand to integrate the IT infrastructures in the local government authorities and provide a unified view of data to all the stakeholders. EAI is an emerging research area in LGAs; as a result, there is an absence of theoretical and conceptual models that differentiate their adoption between the private and government sector organisations. This means there is still a case for the identification of factors that influence the decision making process for EAI adoption in LGAs. Furthermore, for improving LGAs infrastructure and interoperability, the researcher takes this theoretical gap into consideration for research in this thesis and attempts to develop an EAI adoption model that may assist the local government authorities in their decision-making process.

2

Chapter 2: Literature Review - Critical Analysis of the Research Area

Summary

As reported in Chapter 1, less attention has been paid to EAI adoption in the local government authorities. The body of literature suggests that the findings derived from the study of EAI adoption in other sectors may provide some understanding of the phenomenon of EAI. However, they cannot be generalised or applied to LGAs without testing. Among others this may be attributed to LGA's: (a) bureaucratic nature, (b) structure, (c) characteristics, (d) operational and functional activities and (e) decision-making process that significantly differ from other sectors. In an attempt to study EAI adoption in the local government authorities, Chapter 2 critically analyses the literature with a particular focus on LGAs and identifies the research issues. In doing so, this chapter provides the background theory for this thesis that is used in carrying out the research presented later in Chapter 3.

This chapter commences by reviewing the literature on IT adoption in LGAs in Section 2.1. This section presents the analysis of IT adoption in LGAs in the earlier decades. Moreover this section assists in identifying the technical and organisational problems and research issues to study. As a result of the analysis the research conducted in this section, the researcher summarises a timeline that focuses on IT adoption in LGAs. In Sections 2.2 and 2.2.1, the researcher assesses the literature on LGA IT infrastructure and therefore, highlights several IT infrastructure limitations within LGAs. These limitations provide an insight into how LGAs resulted in developing non-integrated IT infrastructures, whereas, Section 2.2.2 highlights the need for integrating LGA IT infrastructures. Section 2.3 begins by analysing EAI literature and explains the business and technical perspectives and current research conducted on EAI adoption in private and public domain in Section 2.4. Thereafter, Section 2.4.1 analyses current research conducted on EAI adoption in LGAs i.e. to assess how LGAs perceive EAI as a technological solution. Section 2.4.2 describes the current research conducted on adoption lifecycle phases, mapping of factors and prioritising the importance of EAI adoption factors. This section emphasises the need to investigate these areas in LGAs. Lastly, summarising the conclusions and highlighting the research issues in Section 2.5.

2.1 Information Technology Adoption in the Local Government Aut

Information technology has been seen as a central part of the modernis (Beynon-Davies, 2005; Newman *et al.*, 2001). The UK public sector recogn the potential to provide and deliver its services more quickly and at a lower cost (Beynon-Davies and Williams, 2003; Brown, 2001). LGAs have used IT to support citizen services since it first appeared (Kim and Bretschneider, 2004; Beaumaster, 2002; Brown, 2001). Initially, in the late 1950s and 1960s, IT applications were gradually adopted to enhance their IT infrastructure and organisational operations, mainly to undertake internal administrative functions but also being used where there was a need for complex calculations (Brown, 2001). Several LGAs' IT projects were large and complex and LGAs own internal specialists were developing them. However, the IT projects were often built with less consideration of citizen needs to solve specific problems (Brown, 2001).

In the 1970s and 1980s, IT applications were adopted in a variety of ways: (a) using in-house resources and different evaluation criteria, (b) outsourced to external providers and (c) joint approaches were used (Khalifa *et al.*, 2001; Brown, 2001; Bretschneider, 1990). One of the motivations for using joint and outsourced approaches was the increasing shortage of in-house IT specialists as the private sector proved increasingly attractive to them (Brown, 2001). In the late 1980s and 1990s, the reliance on expertise of external consultants carried on as the political decision to outsource several government sector services virtually completed the movement of significant IT adoption projects to external consultants and contractors. For example, Inland Revenue firmly locked in long-term relationship with major multinational IT organisations (Hudson, 2001). Similarly, decision makers and top management in many IT infrastructure integration projects in LGAs relied on joint approaches with external expertise (Themistocleous *et al.*, 2005).

Although LGAs have gradually adopted IT applications to improve their internal operation and functions (Irani *et al.*, 2006) they can be characterised as laggards in adopting technological solutions (Themistocleous *et al.*, 2004). Moreover, the increasing reliance on external expertise and consultants, the management of consultants became a cause of concern (Hudson, 2001; Brown, 2001). Additionally, in LGAs, the departments autonomously made their own IT operation decisions and considered technologies and IS solutions based on their requirements and not considering user needs (Di Natale *et al.*, 2003; Beaumaster, 2002; Aldrich *et al.*, 2002). In 1997, the UK government announced that, by 2002, 25% of citizens' dealings with LGAs should be able to be carried out electronically. This was to overcome the organisational and IT infrastructure issues, (b) enhance the business processes, and (c)

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Information technology has been seen as a central part of the modernisation of LGAs (Beynon-Davies, 2005; Newman *et al.,* 2001). The UK public sector recognises that IT has the potential to provide and deliver its services more quickly and at a lower cost (Beynon-Davies and Williams, 2003; Brown, 2001). LGAs have used IT to support citizen services since it first appeared (Kim and Bretschneider, 2004; Beaumaster, 2002; Brown, 2001). Initially, in the late 1950s and 1960s, IT applications were gradually adopted to enhance their IT infrastructure and organisational operations, mainly to undertake internal administrative functions but also being used where there was a need for complex calculations (Brown, 2001). Several LGAs' IT projects were large and complex and LGAs own internal specialists were developing them. However, the IT projects were often built with less consideration of citizen needs to solve specific problems (Brown, 2001).

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From the commencement of the modernisation agenda in 1999, the Audit Commission monitored the progress LGAs made towards the target. Due to this an array of UK government initiatives are launched since 1997, collectively known as LGAs modernisation agenda (Beynon-Davis and Williams, 2003). Literature indicates that along with the modernisation agenda, a parallel set of initiatives i.e. the e-Government agenda, was launched in 2000 and LGAs attempted to extend the use of information systems such as: (a) Customer Relationship Management (CRM) Systems, (b) Data Warehousing (DW), (c) Local Land Property Gazetteer (LLPG) systems, (d) Electronic Document Management Systems (EDMS), (e) Data and Knowledge Management Systems (DKMS) (Chen and Gant, 2001). In addition, developments such as Next Steps – Efficiency Unit, compulsory competitive tendering and, most recently, best value, all signify demands for a more accountable, efficient and effective LGAs, characterised by enhanced levels of performance. This is further acknowledged by Benington (2000), who reports that LGAs in the UK have mobilised a far-reaching programme of change and innovation in organisational forms and culture of the state. The UK Government is attempting to fundamentally change the way in which IT is used to achieve joined-up working between and among LGAs and providing new, efficient and convenient ways for citizens and businesses to communicate with LGAs and to receive services (HMSO, 1999)[2].

Information systems as aforesaid were adopted to automate the business processes and functions, improve the productivity and effectiveness in providing efficient service-delivery, and transform the structures and performance within LGAs (Gortmaker *et al.,* 2004; Salmela and Turunen, 2003; Beynon-Davies and Williams, 2003). Additionally, LGAs adopted IT applications to provide support to meet citizens' needs including housing, social services and benefits, and the management of a complex service infrastructure that supports communities and businesses (Johnson and King, 2005). Fountain (2001) reports that these IS are perceived

1 – Audit Commission is an independent body responsible for ensuring that public money is used economically, efficiently and effectively.
2 – Her Majesty's Stationery Office operates from the Office of Public Sector Information to fulfill its core activities i.e. responsibility for the publication of legislation and management of Crown copyright.

to reap efficiencies for the LGAs by decreasing the cost of processing routine transactions and lowering the data error rates. Gil-García and Pardo (2005) argue that realising the benefits of IT applications requires LGAs to understand and overcome the challenges to their efforts. It appears that the aforementioned IT applications have been developed to solve specific problems and not meeting all organisational requirements of LGAs. For example, EDMS stores multi-media format records that are associated with automated workflow and electronic document repositories but does not assist in integrating records with other different formats. Similarly, LLPG is a property and land referencing system held and updated locally within LGAs which updates a local database. But LLPG is another type of back-office database that needs to be integrated with front office systems. Most of these IT applications were based on the latest technological advances, implemented on different platforms, using various technologies and standards (Themistocleous *et al.,* 2005). In addition, research on IT adoption in the UK LGAs estimates that 20% of all IT expenditure is wasted, while a further 30-40% leads to no net benefits accruing (Heeks, 2003; Willcocks, 1994). A timeline representing IT adoption in LGAs is presented in Table 2.1.

Timeline	Focus within LGAs	References
1950's – 1960's	• Focus on IT applications adoption to improve infrastructures and internal processes.	• Brown, (2001).
1970's – 1980's	• Focus on new IT applications adoption in different ways such as in-house, outsource to external providers and joint approaches.	• Khalifa *et al.,* (2001); • Brown, (2001); • Bretschneider, (1990)
1980's – 1990's	• Reliance to outsource IT development projects to external providers confirmed due to political decisions.	• Hudson, (2001); • Brown, (2001).
1990's – 2000	• Focus to enhance IT use to improve LGA business processes and service delivery. • Modernisation agenda announced i.e. targets set to provide services electronically. • Modernisation government agenda revised – targets revised to provide services electronically by 2008.	• Cabinet Office, (1999). • Beynon-Davis and Williams, (2003) • Audit Commission, (2002)
2000 – 2005	• E-Government strategic framework. • Electronic service delivery target set again - 25% services. • Focus on IT applications (CRM, GIS) to improve legacy business processes, service delivery with-to-date information, improving IT infrastructure. • Electronic service delivery target - 100%.	• Cabinet Office, (1999). • Audit Commission, (2002) • Chen and Gant, (2001); • Beynon-Davis and Williams, (2003).
2006-2007	• Improvements seen but several IT infrastructure and organisational issues still persist within the LGAs. • User satisfaction with LGAs remains high but is declining too.	• Heeks, (2003); • Willcocks, (1994); • Lam, (2005); • SOCITM, (2006)

Table 2.1: A Timeline Representing the Focus on IT Adoption in LGAs

Hitherto, the analysis of the normative literature illustrates that different factors influence IT adoption in the local government authorities (Kim and Bretschneider 2004; Beaumaster 2002; Darmawan, 2001). Nevertheless, there is limited literature evidence describing different phases leading to information technology adoption in the local government authorities (e.g. Darmawan, 2001). The reason for LGAs still facing problems may be due to the fact that the decision makers are overlooking the way IT is adopted in their organisations. For example, Fisher and Wesolkowski (1998) reported that the lack of a systematic framework for IT adoption, coupled with lack of a disciplined and structured approach, leaves the organisation at risk.

Similarly, Clegg *et al.,* (1997) reported that 80-90% of IT investments do not meet their performance objectives, and the reason for this is merely the way in which IT is adopted in the organisations. With such literature evidences, it may be that by ascertaining different IT adoption lifecycle phases, LGAs may be able to identify and prioritise the factors influencing their decision making process for technology adoption on different phases. That is by following a systematic process; LGAs may be able to overcome their problems. However, this is simply an abstraction that may prove beneficial for LGAs, though their validation is important. The normative literature supports that additional literature streams of organisational process research and further stage research must be considered to develop suitable models to understand the processes and outcomes relevant to individual, workgroup, and company-wide technology adoption (Prescott and Conger, 1995).

The issues as aforesaid (e.g. non-integrated IT infrastructure) depict the earlier state of LGAs. However, the current state of LGA across the UK illustrates that the range of functions of LGA websites and the number of transactions now available through them, has increased over the last year. A total of 60 LGAs achieved the top ranking 'transactional' status in 2006 from 38 in 2005 (Better Connected 2006 report). However, since then it has improved from 60 in 2006 to 121 in 2007 (Better Connected 2007 report). Promotional sites, the lowest ranked, have almost disappeared. Generally, LGA websites are continuing to improve, although at a lower rate than has been seen in the last three years. The survey also examined that in some cases; increased functionality may have been achieved at the expense of usability. Nevertheless, usability is yet still a key problem, despite overall improvement by many other measures. Take-up has increased in the last year by 27%; user satisfaction with LGAs electronic service delivery remains high, but is declining too. Analysis suggests that while good progress has been made from a low base since the last three years, most LGAs yet still appear to be struggling. This illustrates several outcomes such as unwillingness to integrate their legacy IS and transform their legacy business process, the majority of which should

have been achieved by the end of 2005 (Grimsley and Meehan, 2007; SOCI
Janssen and Cresswell, 2005).

IT adoption literature indicates that while LGAs have adopted several IT appli
overcome their integration issues and improve their operations and functions, the concerns of: (a) relying on external expertise, (b) providing quality citizen services, (c) automation, and (d) IT integration problems *still persist*. To comply with citizen requirements and harness the full potential of IT to transform their transactions with service users and citizens, LGAs have to: (a) restructure their IT infrastructures, (b) undergo structural and operational changes to accommodate changing citizen needs, (c) improve decision making process while adopting IT, (d) maintain consistency and quality of information across all interaction channels of the organisation and (e) follow an efficient methodical process while adopting IT. The issues as discussed earlier mainly emphasize on the technical problems in LGA IT infrastructures. Section 2.2, illustrates other additional limitations in the local government authorities.

2.2 Information Technology Infrastructure in the Local Government Authorities

The lack of common organisational-wide IT infrastructure has resulted in the development of a diversity of disparate applications within LGAs. The disadvantages of such heterogeneous IT infrastructures are analysed in the literature and include among others: (a) high maintenance cost, and (b) data redundancy and inconsistency (Abie *et al.*, 2004; Gamper and Augsten, 2003). LGAs have attempted to overcome these problems by interconnecting their disparate applications e.g. by point-to-point interconnection (Wimmer, 2002; Bouras *et al.*, 1999). Nevertheless, the normative literature indicates that integration is much more than merely interconnecting the disparate applications and the connectivity of applications was insufficient due to the fact that individual applications were not designed to interoperate with each other (Longo, 2001; Themistocleous, 2004). Two more basic problems for integration are highlighted in the literature such as: (a) each department has several IT applications and each application has its own meaning of different objects (e.g. citizens, staff) and (b) each application has data that overlaps data in other applications. This partial redundancy generates significant data integrity problems (Abie *et al.*, 2004; Gamper and Augsten, 2003).

In the last decade, several public sector organisations (e.g. LGAs) turned to enterprise resource planning implementations in an attempt to surmount the Year 2000 (Y2K) problem and automate their business processes (Vinoski, 2002). Although ERP systems have addressed the Y2K problem, they only provide a partial solution for the integration problem (Themistocleous *et al.*, 2001). The reason is that ERP systems were not designed to integrate have been achieved by the end of 2005 (Grimsley and Meehan, 2007; SOCITM, 2006; Janssen and Cresswell, 2005).

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2.2.1 The Limitations of IT Infrastructures in LGAs

The limitations of IT infrastructures in the local government authorities are explained below.

- **Enterprise Resource Planning Systems Failures:** ERP systems hold high potential to streamline inefficient processes and are reshaping business and government organisations in solving problems posed by portfolios of autonomous applications (Watson *et al.* 2003). However, there are various examples where organisations were not gaining the benefits (e.g. improvements in operational efficiency) that motivated them to make large investments in ERP systems (Songini, 2004; Davenport, 1998). The failures theorised illustrate that ERP projects are set apart by their complexity, enterprise-wide scope and challenges posed by the accompanying large-scale organisational changes in transition to new systems and processes. Themistocleous *et al.,* (2001) also noted that the complexity of ERP systems has forced organisations to collaborate with external consultants to adopt an ERP solution. Nonetheless, the discrepant ERP implementation approaches conceptualised as well as cost overruns, customisation issues and ERP project delays usually cause significant conflicts among organisations and consultants and may lead to failure (Chang, 2004; Wagner and Antonucci, 2004). Thus, the reported failures ascertain that the move towards ERP has not reduced the need for integration, but it has even increased it (Vasconcelos *et al.,* 2004).

- **Organisational Information Sharing and IS Integration:** Organisational information sharing and IS integration are significant ways to change the structure, function and enhance the efficiency and effectiveness of LGAs in providing citizens services (Gil-García *et al.,* 2005; Akbulut, 2002; Landsbergen and Wolken, 2001). As Dawes (1996) points out, information sharing and IS integration, offers organisations a greater capacity to share information across organisational boundaries and to make better-informed decisions based on more complete and integrated data. Gil-García *et al.,* (2005) also reports that information sharing and IS integration allows managers to work at the same time, with the same information drawn from multiple disparate sources.

Within the e-Government perspectives, e-Government initiatives are about the capture, management, use, dissemination, and sharing seamless information (Gil-García and Pardo, 2005). To access seamless information, the standalone IS needed to be integrated to enhance seamless interoperability (Wimmer and Traunmüller, 2002). Nevertheless, the extent of information sharing and IS integration in LGAs has been limited and in several cases does not go beyond the transfer of mandated documents (Gil-García *et al.,* 2005). The reason is that LGAs autonomously made their own IT operation decisions, and considered IS solutions based on their requirements (Di Natale *et al.,* 2003; Aldrich *et al.,* 2002). This may induce LGAs in adopting a single integration solution to effectively solve and support integration at data, object, interface and process levels.

- **Citizen Data Security and Privacy Issues:** All enterprises require a secure environment with reliable technological solutions to function according to their requirements. Mwakalinga and Yngström, (2004) report that the electronic provision of services is one of the main goals of several government organisations. In such an open and distributed processing environment, access control and authentication mechanism is very critical for government organisations. Therefore, a critical obstacle in implementing e-Government is the citizens' concern on privacy of their life and confidentiality of the personal data they are providing as part of obtaining government services (Signore *et al.,* 2005). As citizens' data may contain important information such as: (a) the home address, (b) benefits etc. Access to such information must be controlled as disclosure to irrelevant users may cause problems for citizens' privacy. The government organisations need to provide technical solutions and transparency of procedures. To date several privacy-augmenting technologies exist, e.g. Anonymizer (Osorio, 2001), Crowds (Reiter and Rubin, 1998), Onion Routing (Goldberg *et al.,* 1997), TRUSTe (McCullagh, 1998). Analysing these technologies illustrates that they have their own sets of considerations and each technology differs from other since their design is not focused on same parameters. Thus, there is a need for a technology that provides concrete security approaches to LGAs in securing and providing privacy of citizens' data.

- **Business Process Reengineering (BPR) in e-Government Projects:** E-Government projects have an increasing influence on how business processes evolve and change. Scholl, (2005) reports that while early e-Government projects focused on government-to-citizen information and interaction, the second and third wave of e-Government projects also emphasized internal effectiveness and efficiency along with intra- and inter-departmental as well as intra- and inter-branch integration. With such increases in scale of e-Government projects, existing business processes including core business processes become candidates for improvement and reengineering. In addition, realising a better service provisioning for citizens and businesses is also a big challenge for governments at all levels (Gortmaker *et al.,* 2004). In e-Government, once the service and application potential of the early catalogue and transaction phases is fully utilised, the next developmental step leads to the integration of services and business processes within and across government organisations (Layne and Lee, 2001). Thus, better service provision requires the integration of business processes across multiple LGAs, due to which significant changes to the business logic become a necessity (Scholl, 2003).

- **Front-Office/Back-Office Operations and Functioning:** Several government organisations have set up e-Government initiatives e.g. CRM, Geographic Information Systems (GIS), and EDMS to improve the delivery of services to their citizens. Homburg and Bekkers (2002) note that these initiatives require information exchange through various networks available in the government organisation back-offices. Bekkers (1998) also reports that for e-Government initiatives to be successful, back-office operations and functions, and, more specifically, back-office streamlining has to be taken care of, too. In the e-Government literature, often the focus is on the interaction between government organisations and citizens via web portals, call centres, physical offices and other interacting channels (Janssen and Wagenaar, 2003). Though, to exploit these channels in an efficient and effective way, the need to restructure the administrative operation, functions and processes is clearly felt to support coordination and cooperation between different LGAs. Legacy systems within LGAs often restrict the development of new citizen-oriented processes. As a result, there is a need for an integration technological solution that enables seamless communication between front office and back-office legacy IS and applications and across other LGAs (Wimmer and Traunmüller, 2002).

- **Financial Issues in Implementing Integrated e-Government:** Organisations tend to reduce costs to improve their financial capability. In LGAs, there is a need to reduce the costs of running a non-integrated IT infrastructure as well as to reduce the redundancy/inconsistency of data and systems (Abie *et al.,* 2004; Gamper and Augsten, 2003). Edwards and Newing (2000) report that EAI eliminates the redundancy of data and applications and therefore, reduces operational costs since less effort is required to co-ordinate and maintain the systems. Kalakota and Robinson (2001) suggest that a non-integrated infrastructure often results in a loss of sales that also has a negative impact on the organisation. In e-Government area, integration is needed to increase the performance and efficiency of LGAs, which results in improvements of financial capacity (Themistocleous and Sarikas, 2005).

- **Supporting Management and Decision Making Process:** Zahavi (1999) reports the need to enhance decision-making process and support management with real-time data necessitates the development of integrated IT infrastructures. However, the limitations of existing LGA IT infrastructures inhibit management to take accurate decisions. The reasons for this are: (a) systems heterogeneity (Janssen and Cresswell, 2005), (b) data redundancy and inconsistency (Abie *et al.* 2004; Gamper and Augsten, 2003), (c) low data quality (Gil-García and Pardo, 2005) and, (d) lack of uniform citizen view. For instance, multiple applications store data for the same entity (citizen name and address) but there is often an inability to combine data and take decisions since there is: (a) data incompatibility (Gamper and Augsten 2003), (b) confusion regarding data latency, (c) communication problems (applications cannot communicate and exchange data due to their nature), (d) interdepartmental coordination – coordination has been a continuing problem for LGAs in implementing IT thus, affecting the success of LGAs (Beaumaster, 2002) and (e) uniqueness of integration needs (Adams *et al.,* 2003).

LGAs may also have diverse business processes that require discrete information transformations and process control structures. Often, one application can be developed at different times by distinct group of experts that operate independently and do not consider the interoperability limits. Thus, LGAs need to integrate their financial, human resource, customer support and disparate systems to support management and enhance decision-making process. Figure 2.1 illustrates the IT infrastructure limitations in LGAs.

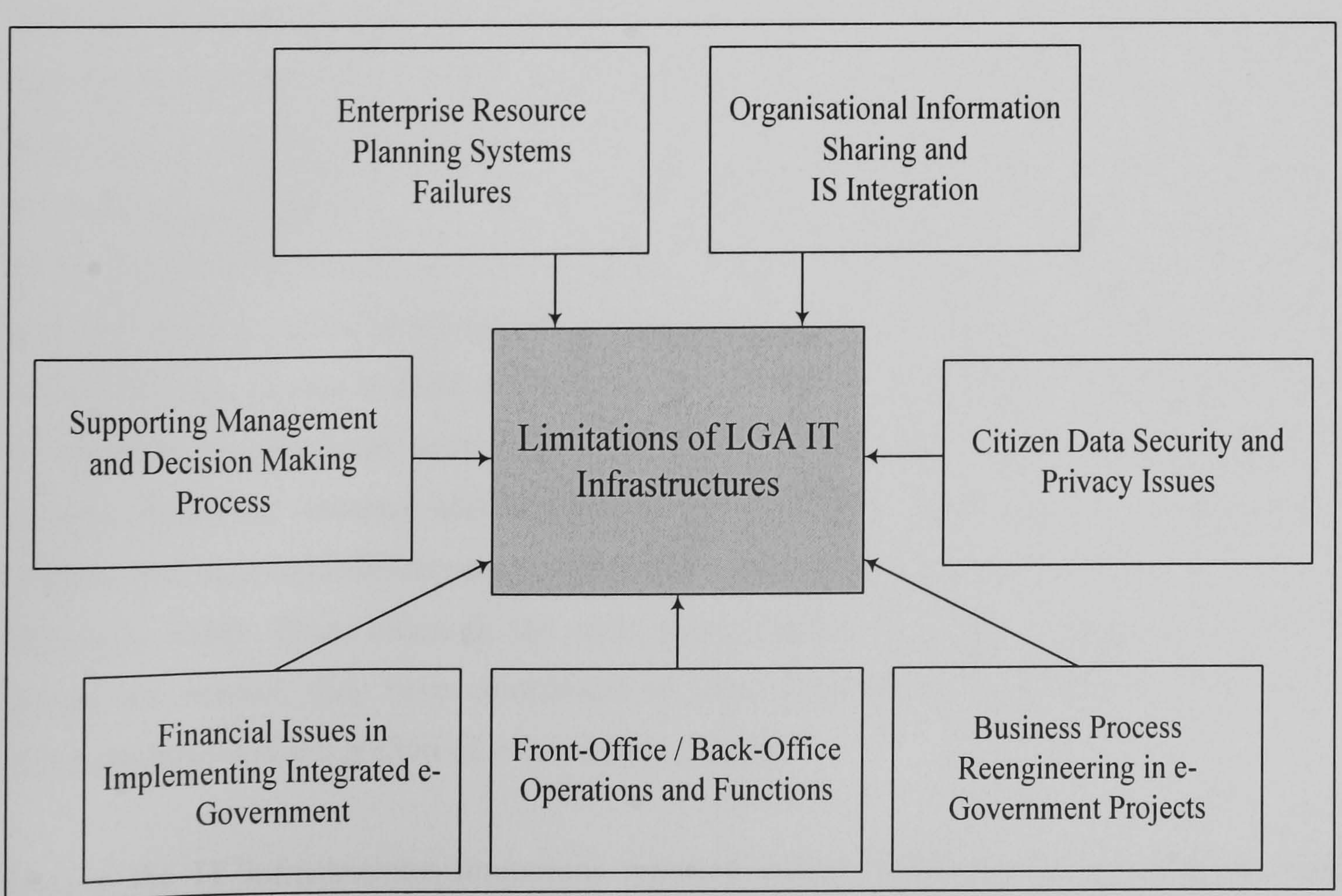

Figure 2.1: The Limitations of IT Infrastructures in LGAs

2.2.2 IT Infrastructure in LGAs – Need for Integration

The assessment of the aforesaid literature illustrates that LGAs need a technological solution to overcome their IT infrastructure limitations. Elmagarmid and McIver (2001) also support that government initiatives still need better solutions. The need for integration may be attributed to several government projects that were either never implemented or abandoned immediately after implementation. Due to this many problems such as data integration and security interoperability that are technical in nature, remain most apparent at developmental and functional levels (Heeks, 1999). Literature indicates that several efforts have been made to achieve integration at various levels of the government in the last decades. These efforts include among others: (a) AnalysePilot (Janssen *et al.,* 2003), (b) SeamlessUK – PINPoint (Atherton, 2002), (c) PASSPORT (Gouscos *et al.,* 2001), (d) TAXISnet (Stamoulis *et al.,* 2001), (e) CiTel (Signore *et al.,* 2005), (f) Local Authorities Secure Electoral Register (LASER) project (UK Online, 2002), SINET (Corbett and Noyes, 2004), Goodna Service Integration Project (Boorman and Geoff, 2002), The Delivery and Access to Local Government and Services (DALI) Project (Ranerup, 1999).

The analysis of these projects report that they have their own sets of considerations and each of them differs from other since their design is not focused on analogous parameters. Although these projects have provided significant benefits, they have not resulted in the development of an integrated IT infrastructure that efficiently automates and integrates LGA business processes and services. The reasons may be that they were developed according to specific requirements and solving certain problems. Moreover, all these projects have been developed in different geographical areas e.g. AnalysePilot project developed for Dutch municipalities, SeamlessUK – PINPOINT developed for UK local authorities, PASSPORT developed for Greek local government. It can be argued that projects developed for a specific area and solving particular problems may not comply with the integration needs in different areas. This may be due to differences in: (a) size and nature of the government organisations in different geographical areas, (b) organisational integration needs, (c) organisational culture, strategies, structure and functionalities etc. Literature also indicates that there are cultural and structural differences in the private and public sector organisations (Ward and Mitchell, 2004). Thus, although the undertaken projects have not achieved the level of integration needed, they have contributed to better understand the limitations of LGA IT infrastructures and integration of information systems.

Due to the IT infrastructure limitations reported earlier, LGAs are constrained and face difficulties to: (a) overcome their organisational and integration problems, (b) provide quality services to citizens and (c) improve their performance and productivity. Literature also indicates that governments are increasingly challenged to respond more flexibly to issues confronting local communities (Lam, 2005; Walsh, 2001). Thus, there is a need for a technology that provides a solution to LGAs that attempts to meet their organisations requirements and integration problems. Clearly, the issues and limitations presented in Sections 2.1, 2.2 and 2.2.1; indicate the need for the adoption of enterprise application integration in LGAs. Since EAI is a new research area within the local government authorities, the review on the EAI adoption area indicates gap in the normative literature. For this reason at this point the absence of theoretical models and research regarding its adoption in LGAs is identified as research issue for further investigation. To provide an understanding on EAI, Section 2.3 reviews the normative literature on EAI.

2.3 Enterprise Application Integration

EAI is a generation of software that combines a variety of integration technologies such as: (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). In other words, EAI acts as a software data translator that takes information from, for example, organisational ERP systems and convert it into formats that other applications can understand (Linthicum, 2000; 1999). EAI also allows the organisations to simplify interactions among applications by adopting a standard approach to integration, replacing hundreds or thousands of ad hoc integration designs (Lam, 2005; Ruh *et al.*, 2000; Linthicum, 2000).

Literature indicates that for "*x*" applications a total of "*(x*(x-1)/2)*" interconnections are needed when each application is interconnected with the rest of the applications (Themistocleous, 2002). This can be explained as e.g. when an application is interconnected (through traditional integration) to several other applications that require any change, it affects all other applications because it has equivalent number of interconnections with those applications. On the other hand, when the same application that is integrated through EAI architecture requires some changes; the rest of the system is rarely affected. The reason is that these systems are not directly interconnected with the application that requires those changes. Thus, this way only those applications that require changes are altered, resulting in a reduced maintenance effort and increased flexibility with few interconnections among the applications (Themistocleous, 2002). Figure 2.2 illustrates the differences in the number of connections when traditional integration approaches and enterprise application integration are adopted.

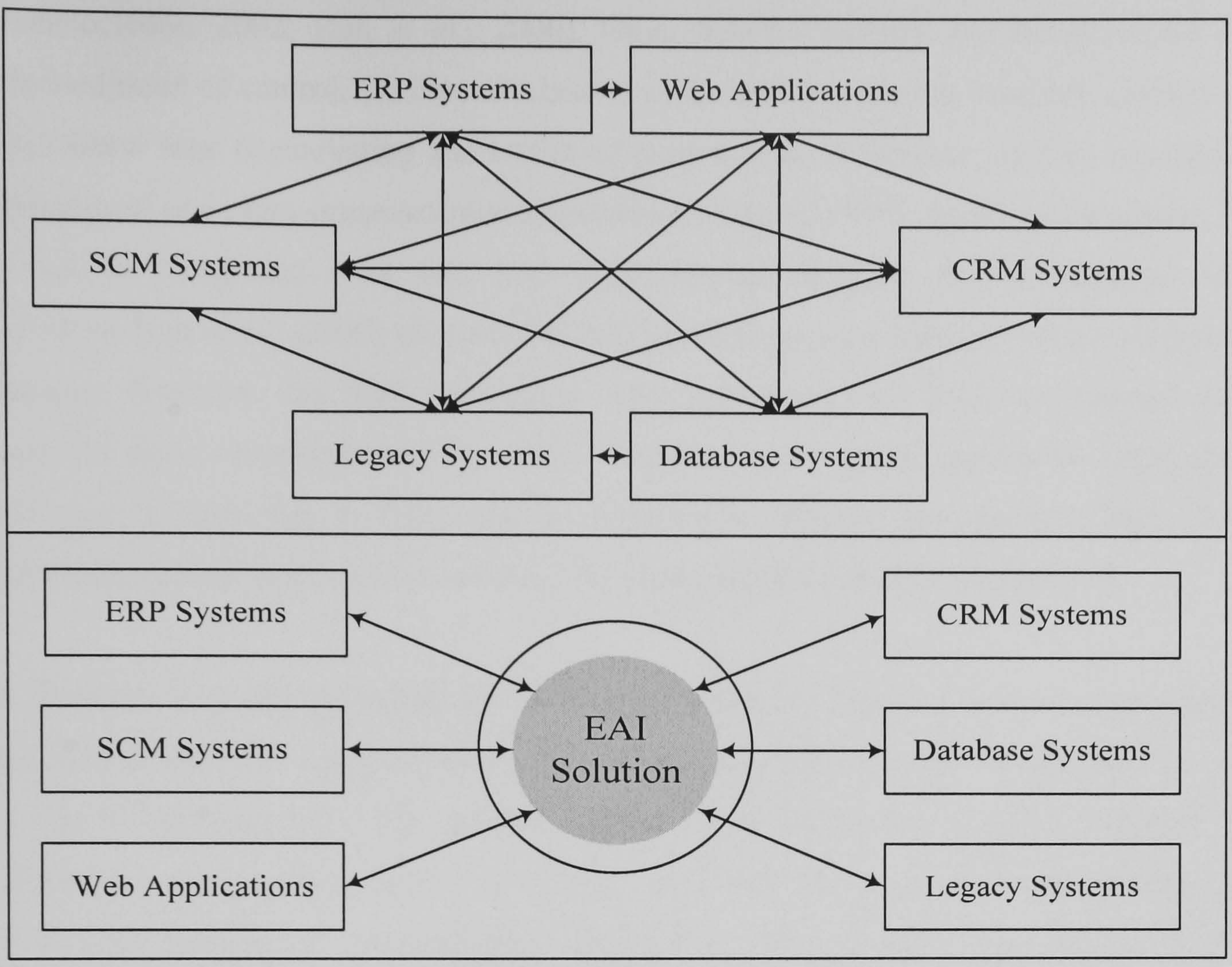

Figure 2.2: Traditional Integration Approaches v/s Enterprise Application Integration

Organisations that have integrated their IT infrastructures through EAI have reported significant benefits (Bass and Lee, 2002). For example, Themistocleous and Irani (2001) analysed and explained the benefits that derive from the use of EAI technology. They classified the benefits into: (a) organisational (e.g. resulting in organised business processes), (b) managerial (e.g. achieving significant return on investment), (c) operational (e.g. reducing the operational cost), (d) strategic (e.g. increase in collaboration among different partners and suppliers), and (e) technical (e.g. achieving integration at different levels i.e. data, objects and process). Literature also indicates another significant EAI business benefit i.e. the reduction of overall integration cost and the reason for this is due to the decrease in both integration time and maintenance costs (Linthicum, 2000). In addition, EAI provides a flexible, manageable and maintainable IT infrastructure that supports the changing business and technical requirements (Themistocleous *et al.,* 2005). Based on the EAI integrated organisation-wide architecture, organisations can increase their productivity and provide better services for their customers and improve their relationships with their clients (Ruh *et al.,* 2000).

In this context, by employing EAI effectively, organisations can: (a) leverage their existing assets to provide enhanced services, (b) improve their relationships with customers and other stakeholders, (c) improve their performance, as well as (d) to streamline its operations

(Themistocleous, 2002; Ruh *et al.*, 2000). Other benefits include: (a) the provision of a centralised point of control, (b) the reduction of skills level required to integrate applications, and (c) faster time to marketing and increased market share. Moreover, as EAI incorporates organisational and cross-organisational applications (Zahavi, 1999), from this viewpoint, EAI can lead to integrated intra and inter-organisational systems. By enabling all these capabilities, Ruh *et al.*, (2000) claimed that EAI can help an organisation create a competitive advantage. However, the high investment costs associated with EAI have caused much concern for many organisations (Chen, 2005). Sanchez *et al.*, (2002) argued that although the initial cost of investing in EAI may be daunting to several organisations, the cost of integration is in fact more extensive when EAI technological solutions not adopted.

This illustrates 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). Therefore, each application that has data (with own meaning) may overlap with data in other applications. This data redundancy and inconsistency generates vital data integrity problems and increases the maintenance and integration cost. As the literature indicates that EAI is based on a set of integration technologies, each EAI package differs from other EAI package (Linthicum, 2000). The reason is that each EAI vendor configures its EAI package using a different subset of integration technologies. Thus, during the selection process organisations need to evaluate their EAI technologies to meet their organisational and integration problems.

In addition, unlike other integration technologies such as Electronic Data Interchange (EDI) and integrated packages such as ERP, EAI is supported by adapters for each application (Kaye, 2003; Sanchez *et al.*, 2002). However, web services also use similar concepts to EAI as web services are a part of EAI e.g. supported by adapters for each application, and are considered as a low cost alternative for integration (Themistocleous and Irani, 2006; Kaye, 2003), but Charlesworth and Jones (2003) report that the reality is still several years off. The reason is that rather based on a single, coherent set of web services terms, protocols, and technologies, the industry has approached development of the web services in an ad hoc form with several web services standards. Altman (2003) also report that while web services may be desirable for some organisations, it is not particularly useful for highly complex technical issues. Moreover, while the basic concept for web services promises far greater interoperability than other approaches before (Tilley *et al.*, 2002), some limitations in response time and scalability were found in practice (Litoiu, 2002; Cardellini *et al.*, 2001).

In addition, the technical changes and flexible ways of system inter-operation through the use of web services present new organisational challenges e.g.: (a) the sourcing mix, (b) integration of internal and external resources, (c) new skill acquisition (Farrell and Kreger, 2002; Hagel and Brown, 2001). Additionally, web services do not deliver solutions to support: (a) transformation, (b) routing, (c) process management, and (d) transactional integrity (Charlesworth and Jones, 2003; Farrell and Kreger, 2002). Conversely, EAI can provide solutions to support these services because EAI simplifies the connectivity, transformation, routing and providing a central point of management capable of integrating application and business processes (Charlesworth and Jones, 2003). To further understand EAI, Sections 2.3.1 and 2.3.2 identify and explain EAI business and technical perspectives.

2.3.1 EAI – A Business Perspective

An important aspect of EAI is its externality of enterprise integration with lower costs and less programming using existing, legacy and packaged applications (Lee *et al.,* 2003). This illustrates that EAI aims at modernising, consolidating, and coordinating the overall computer functionality in an organisation. Typically, an organisation has existing, legacy and packaged applications and database systems, and wants to continue to use them while moving towards more advanced IT (Lee *et al.,* 2003). EAI may assist the organisations in developing integrated systems and enhancing their business processes (Edwards and Newing, 2000), determining how existing applications fit into the new view, and then devising ways to efficiently reuse what already exists while adding new applications and data. Previously, integration of IS required rewriting codes on source and target IS, which in turn, consumed much time and money (Lee *et al.,* 2003). Unlike traditional integration approaches (e.g. Figure 2.2), EAI serves as a bridge between different applications for system integration. All applications can freely communicate with each other through a common interface layer rather than through point-to-point interconnections. Thus, EAI assists in eliminating extensive programming. Several other EAI characteristics are theorised in the normative literature that explain EAI operations and functions such as:

- **EAI Maintaining Integrity:** Orovic (2004) reports that amongst the most important activities in EAI management is ensuring the integrity of the solution throughout the integration life cycle. Bass and Lee (2002) report here that EAI presents a systematic approach to integration problems by delivering solutions that can manage volumes of complex transactions through entire business processes across multiple platforms and systems. By using process modelling, organisations may be able to define potential solutions, simulate solutions to analyse information flow, and easily change the process with minimal coding. It can be argued that this approach often challenges organisations with integration on a scale they have not attempted and requires a correspondingly large infrastructure investment to maintain integrity of strategic transaction processes.

- **EAI Improving Systems Productivity:** Systems productivity occurs when information is extended to employees, customers, and partners in a manner previously unavailable (Laroia and Sayavedra, 2003). For example, employees gaining access to their company's data, regardless of location or presentation tool (e.g. laptop, cellular) with the data being updated automatically as new information arrives. Systems productivity also occurs when information is centrally aggregated into an information portal tailored to different business functions within an organisation. For instance, accounting personnel and business executives may draw on the same information, but the way they use that information differs. EAI helps keeping the wealth of knowledge that is embedded in core legacy systems alive (Ruhe and Du, 2004).

- **EAI Streamlining Data Flows and Data Cleansing:** Data is an organisation's asset and it makes its way from an initial entry into every department and through multiple systems, data stores, and reports, it is manipulated and duplicated, and changed until organisations end up with redundancy of data (Darmawan, 2001; Howard, 1985). As the business changes and data become increasingly granular, new systems model, store, and access data. An important productivity benefit that EAI can offer is the ability to streamline data so that it flows easily between different applications (Ruhe and Du, 2004). Nevertheless, data can take many paths and forms over time. Redundant and inaccurate data is extremely costly to maintain and clean. Literature indicates that EAI reduces the need for redundant data and minimises repetitive data entry requirements that reduces errors and improves the accuracy of data that exists in systems (Zahavi, 1999).

- **EAI Meeting Business Requirements:** Business partners can be more demanding than customers. Ruhe and Du (2004) reported that business partners have the right to expect to communicate in real time, to meet the highest standards of effectiveness, and to nurture joint customer relationships. EAI is not just for internal processing. A plethora of EAI technologies are designed to improve communication and productivity across the extranet in support of business partners and suppliers. Linthicum (2000; 1999) and Illback and Sholberg (2000) support that EAI helps organisation meet their business requirements and deliver better business by keeping older applications that support the core business. Moreover, integrating new applications with existing IS to increase their value and reduce the cost of upgrading technology.

- **EAI Costs:** EAI costs can be illustrated in three components: (a) architecture, (b) integration, and (c) operations. EAI architecture costs are capital costs related to the initial deployment such as the integration development, execution, and operations environments. They include the license cost negotiated with vendor, the cost of hardware required for integration, and the cost to implement architectural software and hardware (Sanchez *et al.*, 2002). Bass and Lee (2002) report that roughly 80% of architecture costs are incurred within six months of implementation, while additional expenses may be incurred for hardware or licenses as usage spreads. This illustrates that the complexity of the EAI software and the number of discrete businesses drives the architectural costs.

  EAI integration development costs are separate from architectural costs and often capitalised (Bass and Lee, 2002). They include the development of interfaces and collaborations between systems. The integration development cost is variable and driven by the number of interfaces developed. Integration costs with EAI are generally between 25 - 40% lower than with custom integration (Bass and Lee, 2002). Development is less expensive because adapters come pre-built with the EAI architecture and the architecture provides a graphical interface in which to perform mapping and many pre-built functions. For examples message transport, guaranteed delivery, and process control. Fewer interfaces are needed since all applications communicate with a common middleware.

  Unlike EAI architectural and integration cost, EAI operating costs are expensed and include ongoing operations and maintenance of EAI system for architecture and integration. The number of interfaces that need to be maintained generally drives operating costs that rise as more interfaces go into production. EAI provides up to 80% reduction in application maintenance cost by reducing the number of interfaces that need to be maintained and offloading much of the costs of interface maintenance onto EAI solution provider (Ruhe and Du 2004; Kalakota and Robinson, 2001).

- **EAI Structuring Business Processes:** Nothing raises interest in integrated systems like the success of integrated systems (Laroia and Sayavedra, 2003). Though, with increased interest, comes increased cost. Business systems grow and multiply, requirements to integrate these systems increases, and as they do, the complexity of the integrated environment and cost to maintain it exponentially increases. EAI makes integration much more manageable, flexible, and affordable (Badii and Sharif, 2003; Urlocker, 2000). Organisations can plan and introduce new applications, design new data requirements in the context of the overall integrated business process flow, rather than integrating business processes by customising one application at a time.

- **Coupling and Synchronous / Asynchronous Communication:** Coupling refers to the degree of tightness and/or dependence between two different/similar systems (Janssen and Cresswell, 2005). Literature classifies integrated applications according to the degree (loose and tight coupling) of integration achieved (Brown, 2000). This categorisation is important, as organisations tend to follow one or the other degree of integration when incorporating their information systems. Loose integration is usually followed by loosely coupled trading partners (Helm, 1999). These partnerships select loose integration to simply share or exchange information electronically. Puschmann and Alt (2001) reported that loosely integration is correlated with asynchronous communication. The type of communication determines the dependencies between two applications and influences the processing sequence of the involved applications (Serain, 1999).

  Literature indicates that tightly integrated applications are characterised by a higher degree of process dependency. Puschmann and Alt (2001) report that tightly integrated applications follow synchronous communication with the sender application pausing its operations and waiting for the receiver to execute senders' requests or process the data requested and reply. This type of communication is accomplished in a co-ordinate manner that may lead integrated applications to failure if a system is unable to execute a process (Ruh *et al.,* 2000). In this case, all partners fail as they all participate in the same logical business process (Linthicum, 1999). Erlikh (2003) argues that EAI based coupling allows for independence and encapsulation of individual system components. While each business component publishes a clear defined set of Application Programming Interfaces (APIs), the modern approach is to move away from rigid program-to-program connectivity towards more loosely coupled message- or event-based connectivity.

- **Workflow for EAI:** EAI enables the quick development of systems at low cost by handling each of the various applications used inside and outside a business as components and then combining the components to develop applications (Oba and Komoda, 2001). Workflow for EAI uses a business process. Expressing changing workflows and rules as business processes enables the user to build a structure that responds readily to change. Workflow for EAI entails dividing a task into a flow (business process) and task logic (components) before designing and developing the system. In practice, workflow for EAI defines the business process of the target tasks and maps the packages to be executed. The existing systems and new systems are also mapped to the business process. The packages and systems are connected using connecting components such as adaptors and wrappers. This enables the user to build a system that responds promptly to change.

- **Transformation through EAI:** Advances in Information and Communication Technologies (ICT) and the ability to increasingly piece together once disparate ICTs through the power of EAI have shifted the expectation of realisable benefits to a more citizen focused as well as service-chain agenda (Sharif *et al.,* 2005; Ho 2002). From a cross-departmental or cross-government perspective, EAI enables the transformation to new e-Government facilitation, which emphasizes increased collaboration and cooperation that have a resulting impact on the citizens. Furthermore, potential benefits of an e-Government infrastructure are enabling government organisations to interact directly and work better with businesses, irrespective of their locations within the physical world. This includes digitising procurement services from and to businesses to improve their service quality, convenience, and cost effectiveness. Clearly, the challenge lies in realising the benefits anticipated, managing costs portfolios and mitigating risks, and in doing so, preventing ICT project failure.

The aforesaid EAI business perspectives are summarised in Figure 2.3.

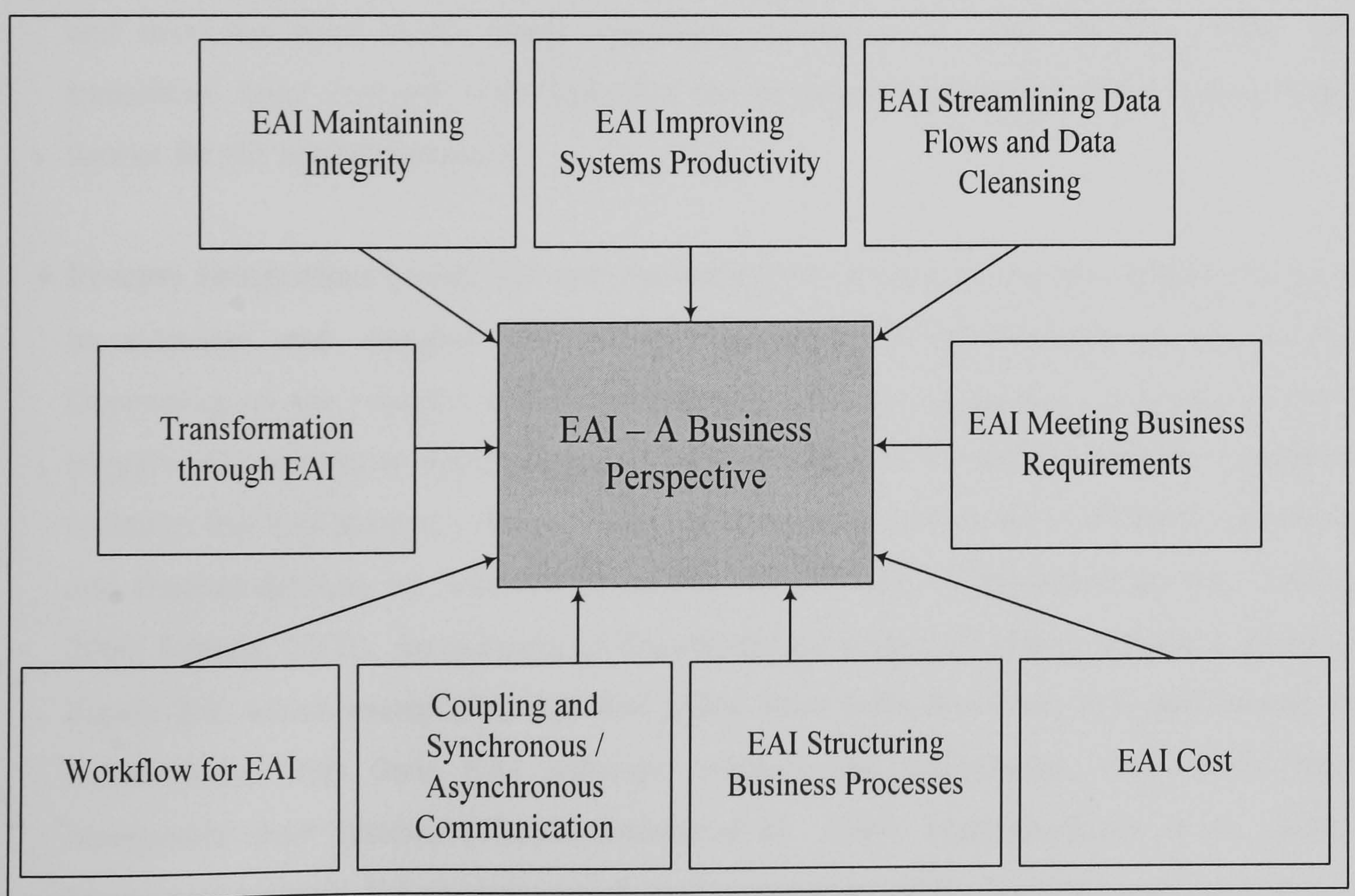

Figure 2.3: Enterprise Application Integration Business Perspectives

2.3.2 EAI – A Technical Perspective

Several approaches were proposed in the normative literature to describe EAI. Duke *et al.,* (1999) suggest that a solution based on enterprise application integration involves the transportation and transformation of information between one or more applications. It also supports: (a) the timing and sequencing rules that govern when the transportation and transformation takes place and, (b) the integrity constrains that determine the success or failure of the integration. However, Themistocleous *et al.,* (2006) proposed a model and reported that EAI supports four levels of integration: (a) data, (b) process, (c) knowledge management and (d) application integration. In addition, Themistocleous *et al.,* (2006) model also consists of the following integration layers: (a) connectivity, (b) transportation, (c) translation and (d) process integration and (e) knowledge management integration and described below:

- **Data Integration Level:** Literature refers to the first three layers (connectivity, transportation and translation) using the term data integration level (Themistocleous *et al.,* 2006). The connectivity layer creates common points of access between the interconnected applications and EAI infrastructure. The transportation layer is responsible for the exchange of application elements (e.g. data, objects) between EAI and applications i.e. transferring the information from source application to the integration infrastructure and from the latter to the target application (Stonebraker, 1999; Zahavi, 1999). The translation layer converts and reformats the application elements into a recognisable format for the target(s) systems.

- **Process Integration Level:** The process integration level uses the data integration level to automate and integrate the business processes (Themistocleous *et al.,* 2006). Depending on the requests and information, the process integration level receives and triggers all appropriate applications or tasks to integrate a business process. Literature indicates that EAI supports business process integration that results in efficient operations and flexible delivery of business services to the customer (Themistocleous and Corbitt, 2006; Erasala, 2002). An example of the use of EAI in the UK public domain is given in Figure 2.4, which exemplifies that few LGAs have built their own EAI architecture in collaboration with their EAI software vendors and consultants, with which they incorporate their systems (Themistocleous *et al.,* 2004; Themistocleous *et al.,* 2005). Integration requires the re-engineering, and automation of the business processes within the organisational level. Figure 2.4 illustrates that EAI architecture also attempts to integrate different systems within LGAs. This allows end-to-end exchange of information. The benefits derived from such EAI architecture are: (a) the generic benefits associated with EAI implementations as described in literature (Puschmann and Alt, 2001) and (b) the specific benefits that are related to the LGA integration e.g. improved performance, productivity and integrated service delivery (Themistocleous *et al.,* 2005).

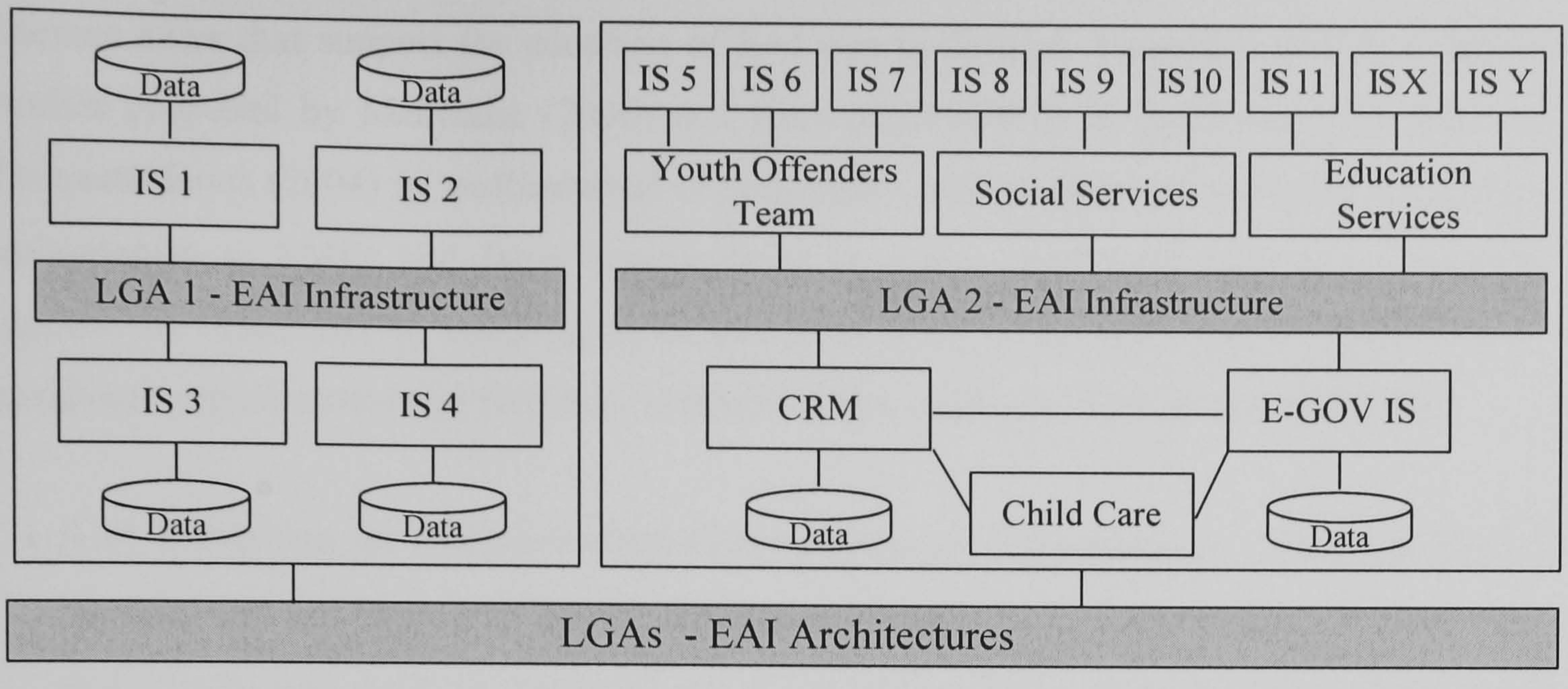

Figure 2.4: Examples of EAI Infrastructure in LGAs

- **Knowledge Integration Level:** This implies that knowledge can be exchanged, shared, evolved, refined and be made readily available to the point of need (Badii and Sharif, 2003). Conversely, Themistocleous *et al.,* (2006) and Badii and Sharif, (2003) suggested that EAI can not only support the data and process integration levels but also the knowledge integration level. This signifies that EAI can successfully integrate the knowledge that is stored in multiple locations, services and IS (Themistocleous *et al.,* 2006). In doing so, the researcher presents two exemplar cases from the public domain literature to exhibit that the knowledge integration level results in more efficient, effective and enhanced decision-making process. This finding also supports the researcher's point of view that EAI is an appropriate solution for the integration problems faced by LGAs. Themistocleous *et al.,* (2006) stated that the knowledge management integration layer is related to the application integration level as knowledge is pull out from applications and is integrated using important elements from the process integration level.

- **Application Integration Level:** Themistocleous *et al.,* (2006) reported that knowledge management integration layer is related to the application integration level as knowledge is pull out from applications and is integrated using important elements from the process integration level.

2.4 Current Research on EAI Adoption in Private and Public Domain

This section reviews the literature on EAI adoption in the public and private domains and attempts to understand: (a) different factors influencing their decision making process and (b) how EAI might be used to support LGAs' IS integration and enhance their decision making process. Due to the limitations in EAI adoption literature in LGAs, a critical review on other relevant areas that support the adoption of EAI was performed. Examples of EAI adoption models proposed by Mantzana (2006) and Khoumbati (2005) in healthcare organisations, Themistocleous (2004) in multinational organisations, and adoption of emerging integration technologies in SMEs and large organisations by Chen (2005) are reviewed. This may support the researcher in adapting to factors from other areas (e.g. EAI in multinational, healthcare organisations and SMEs) to conceptualise a model for EAI adoption in LGAs.

- **EAI Adoption in Multinational Organisations:** Themistocleous (2004) evaluated the adoption and impact of EAI in multinational organisations and resulted in proposing an EAI adoption model in multinational organisations. The conceptual model illustrates a number of factors such as: (a) benefits, (b) barriers, (c) IT infrastructure, (d) costs, (e) external pressures, (f) IT sophistication, (g) framework for evaluating integration technologies, and (h) support. After pragmatic results, Themistocleous (2004) resulted in adding more factors such as: (a) internal Pressures, and (b) framework for evaluating EAI packages. However, further analysis shows that Themistocleous (2004) extended these factors e.g. classifying *cost* factor into three sub factors such as: (a) direct cost, (b) indirect human cost, and (c) indirect organisational cost. Then, explaining (a) operational, (b) managerial, (c) strategic, (d) technical and (e) organisational *benefits* and *barriers*, whereas, illustrating organisational *internal pressures*, and *external pressures* into: (a) competitors and (b) trading partners. Similarly, describing *support* factor into: (a) consultant support, (b) vendor global presence, and (c) vendor support. These factors have been well researched and analysed in more than 30 case studies in the private and public domain (e.g. healthcare organisations) and reported in the literature.

- **EAI Adoption in Healthcare Organisations:** Khoumbati (2005) followed the stream of EAI research area, he analysed the literature and reported that the non-integrated IT infrastructure within healthcare organisations causes medical errors that are related to the loss of human lives. As the information needed is not available on time, errors usually occur in prescribing, administering and dispensing drugs to patients. Khoumbati (2005) also reported that the limitations of healthcare systems are related to the loss of 64 persons per day (23,360 people per annum) in the UK, due to problems related to medical errors. Therefore, accentuating the need for integration for healthcare sector. By focusing on these problems, Khoumbati (2005) evaluated and proposed an EAI adoption in healthcare organisations. Khoumbati (2005) adapted to and revised Themistocleous (2004) EAI adoption model. Khoumbati (2005) added specific healthcare related factors from EAI and healthcare informatics literature. In addition to the factors incorporated from Themistocleous (2002) model, Khoumbati (2005) included more factors such as: (a) patients satisfaction, (b) organisation size, (c) physician and patient relationship, (d) telemedicine, and (e) compatibility. After practical results, Khoumbati (2005) revised the model and added two more factors: (a) education, and (b) security and confidentiality. These factors have been well investigated in the literature.

- **Framework of Actors and Factors Affecting EAI Adoption in Healthcare Organisations:** Mantzana (2006) observed from the healthcare literature that 13 out of 14 of the proposed factors by Khoumbati (2005) focus on organisational and technical issues (dimensions) but not on social. However, Mantzana (2006) reports from (Fitzerald *et al.*, 2002) that not only technical and organisational, but also human factors need to be considered to reduce the complexity of EAI adoption and enhance its management. This is possibly a limitation of the literature in healthcare sector as Mantzana (2006) reported from (McGrath and More, 2001) that there are also "People-Related Issues" (e.g. actors involved) that should be studied and analysed by organisations when introducing integration technologies in healthcare. The unawareness of human actors increases the actors' resistance to adopt EAI (Mantzana *et al.,* 2007). Thus, decision-makers involved in the development, evaluation and adoption processes may need to consider the actors to successfully accomplish them (as reported by Mantzana [2006] from Turunen and Jan, [2000]). In doing so, 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. Moreover, she identified the causal relationships among the healthcare actors and factors that influence EAI adoption.

- **Integration Technologies Adoption in Private Organisations (e.g. SMEs):** Chen (2005) reviewed innovation and diffusion literature and reported that a considerable amount of research, where attention is given to a range of features which may support integration technologies adoption. However, literature suggests that the findings derived from the study of large enterprises cannot be applied in SMEs due to the distinct characteristics of SMEs. Although the adoption of integration technologies is recognised as being different between large and small companies, the literature on its adoption by SMEs remains limited. Nevertheless, in existing work, there is a lack of studies emphasising the reasons why SMEs and large companies take the decision to adopt integration technologies, focusing specifically on the different factors. Chen (2005) therefore, identified the significant differences in the way that SMEs and large companies approach integration technologies, based on the existing literature, theoretical diffusion theories, and resource-based theory.

In doing so, the factors used to explain the adoption of integration technologies in SMEs and large organisations are identified such as: (a) nature of organisations, (b) company size, (c) integration needs, (d) time, and (d) adoption factors for SMEs and large organisations. Additionally, adoption factors for SMEs and large organisations are found and classified into three categories such as: (a) adoption factors explicit to SMEs, (b) adoption factors explicit to large organisations, and (c) common factors. Chen (2005) further extended these categories and added sub factors such as: *adoption factors explicit to SMEs* included: (a) adopter characteristics, (b) IT sophistication, (c) dependency on trading partners, and (d) government regulations; *adoption factors explicit to large organisations* include: (a) IT infrastructure, (b) IS complexity, (c) internal pressure, (d) perceived future prospects; and *common factors* include: (a) perceived benefits, (b) perceived barriers, (c) perceived financial goals, (d) external pressures, and (f) competitive pressure. Based on these results, a revised conceptual model was proposed to explain different factors that influence adoption of integration technologies between SMEs and large organisations. The analysis of this model exemplifies that Chen (2005) incorporated several factors from EAI model by Themistocleous (2004).

Reviewing the normative literature on EAI adoption in private and public domain illustrates that Themistocleous (2004) adapted to several Electronic Document Interchange (EDI) factors to develop an EAI adoption model in multinational organisations. Khoumbati (2005) and Chen (2005) further adapted to several common factors (e.g. benefits, barriers, cost, and IT infrastructure) from Themistocleous (2004) EAI adoption model. In addition to adapting to common factors, Khoumbati (2005) and Chen (2005) also presented domain specific factors in their models. Although Khoumbati (2005) and Chen (2005) validated Themistocleous (2004) findings (e.g. the common factors) and their outcome (e.g. specific domain factors) with results from case studies conducted in their specific domain, these models may or may not be applicable or generalised to LGAs. The reason may be that, for example in healthcare organisations, Khoumbati (2005) reported 'physician and patient relationship' as a factor for EAI adoption in healthcare organisations. 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 sector organisations. In this case, 'physician and patient relationship' factor cannot be considered in LGAs while taking decisions for EAI adoption.

Conversely, Khoumbati (2005) has not included some extended sub factors from Themistocleous (2004) EAI adoption model, for example external pressure sub factor such as: (a) competitors. The reason is that healthcare organisations provide healthcare related service to citizens and may not work in competition with other healthcare organisations. Results from case studies conducted in healthcare organisations depict that there is external pressure from the government organisations (e.g. National Health Service [NHS]) for the provision of better healthcare services to the citizens and from partner organisations for improvement in close collaboration. The pressures from LGA members such as primary care services providers and social services providers for the sharing of patient information also represent external pressures. In addition, the pressures from citizens for the improvement of healthcare facilities such as availability of their healthcare records wherever and whenever required to the healthcare services providers for better healthcare also represent external pressures. These results show that there is pressure from external organisations; however, it can be said that this pressure is to: (a) improve healthcare related services, (b) improving collaboration and (c) information sharing, not to compete with other healthcare organisations. Other factors reported by Themistocleous (2004) can be considered as generic and are found in several other integration technology models (Bradford and Florin, 2003; Chwelos *et al.*, 2001; Iacovou *et al.*, 1995). Khoumbati (2005) also incorporated these factors (e.g. benefits, cost etc.) after revising Themistocleous (2004) EAI adoption model. This exemplifies that Themistocleous (2004) EAI adoption model can be considered as a basis model for building an understanding towards the development of an EAI adoption model in LGAs.

Although Chen (2005) adapted to some common factors from Themistocleous (2004) EAI adoption model, yet still Chen's (2005) model differs from models proposed by Themistocleous (2004), Khoumbati (2005) and Mantzana (2006). Chen (2005) did not specifically research on EAI; instead Chen (2005) identified the significant differences in the way that SMEs and large companies approach integration technologies. The differences include: (a) the availability lower levels of resources, (b) the substantially less sophisticated IS management, (c) the needs for integration and their characteristics, and (d) the quantity and quality of the available environmental information. For these reasons, the general applicability of the studies in large organisations may be questionable if applied to small businesses. Similarly, as a result of the unique characteristics of small businesses, there is a need to examine whether those models for IS adoption developed for the large-business context can be equally applied to small businesses. With such reasons and differences among SMEs and large organisations, the models developed for SMEs and large organisations may not be completely adapted within LGAs. Table 2.2 depicts specific domain factors and common factors among different domains. In Table 2.2, the first column illustrates the main factors derived from EAI studies conducted in Multinational Organisations (MO), Healthcare Organisations (HO) and SMEs. The second column illustrates several extended sub factors resulting from the classification of main factors. However, (–) symbol in the second column indicates that the main factors have not been classified for sub factors. In addition, the first column denotes the main factors as "node" from F1 to F21. In the case of SMEs, factors such as benefits and barriers (F2), IT Sophistication (F3), External Pressures (F4), Internal Pressures (F5), IT Infrastructures (F6) and Competitive Advantage (F17) are sub factors of "Factors for SMEs and Large Organisations" in the model developed for SMEs.

	Factors	Sub Factors	MO	HO	SMEs
F1	Cost	Direct Cost	✓	✓	
		Indirect Human Cost	✓	✓	
		Indirect Organisational Cost	✓	✓	
F2	Barriers / Benefits	Operational	✓	✓	
		Managerial	✓	✓	
		Strategic	✓	✓	
		Technical	✓	✓	✓
		Organisational	✓	✓	✓
F3	IT Sophistication	–	✓	✓	✓
F4	External Pressures	Competitors	✓		
		Trading Partners	✓	✓	✓
F5	Internal Pressures	Organisational	✓	✓	✓
F6	IT Infrastructures	–	✓	✓	✓
F7	Support	Consultant Support	✓	✓	
		Vendor Global Presence	✓		
		Vendor Support	✓	✓	
F8	Framework for Evaluating Integration Technologies	–	✓	✓	
F9	Framework for Evaluating EAI Packages	–	✓	✓	
F10	Compatibility	–		✓	
F11	Telemedicine	–		✓	
F12	Physician and Administrators Relationship	–		✓	
F13	Security and Confidentiality	–		✓	
F14	Education	–		✓	
F15	Patient Satisfaction	–		✓	
F16	Organisational Size	Business Complexity			✓
		–		✓	
F17	Competitive Advantage	–	✓		✓
F18	Nature of Organisation	Expertise Constraint			✓
		Time Constraint			✓
		Financial Constraint			✓
F19	Time	Initiator			✓
		Facilitator			✓
		Consumer			✓
F20	Integration Needs	Active mode			✓
		Passive Mode			✓
F21	Factors for SMEs and Large Organisations	Adopter Characteristics			✓
		Dependency on Trading Partners			✓
		Government Regulations			✓
		IS Complexity			✓
		Perceived Future Prospects			✓
		Perceived Financial Costs			✓

Table 2.2: EAI Influential Factors Proposed in Various Adoption Models

The abovementioned analysis illustrates that there is plethora of factors explained in the literature regarding EAI adoption but not in LGAs, however, there is a relative void in literature regarding EAI adoption in LGAs. On the other hand, these models may provide an underlying understanding regarding EAI adoption in LGAs. Nevertheless, the overall applicability of all theorised EAI adoption models may not provide the same outcome in LGAs. This may also be attributed to their differences in: (a) structural and cultural, (b) bureaucratic nature, and (c) operational and functional activities. In addition, after careful analysis of the literature it can also be said that there is lack of EAI adoption models within LGAs. Thus, LGA officials seek answers for the effect of EAI adoption, for the reason that it will assist them in understanding EAI technological benefits, barriers and costs. Figure 2.5 depicts the availability of validated EAI and integration adoption studies in other sector organisations and lack of EAI adoption model in LGAs.

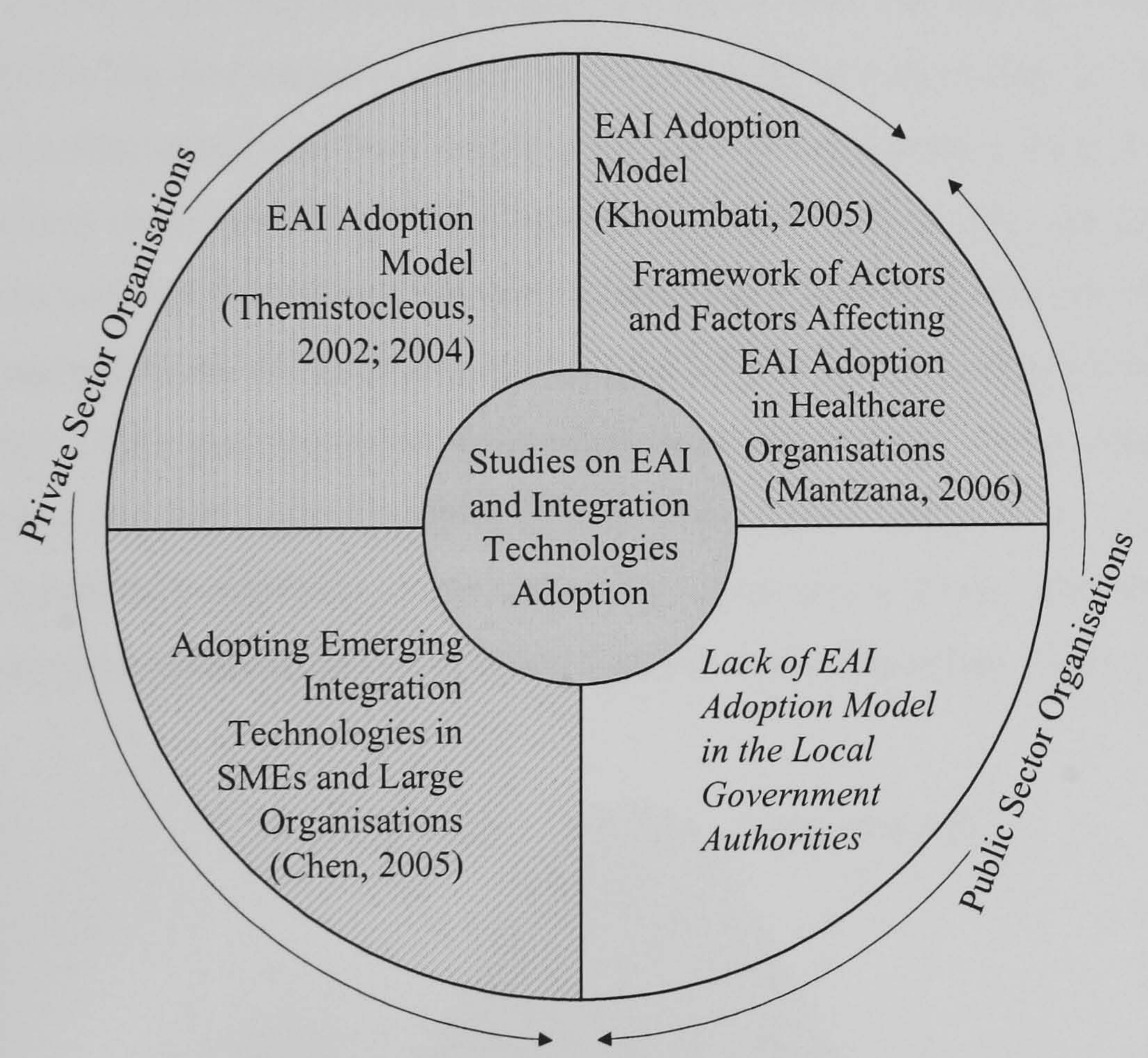

Figure 2.5: Studies on EAI and Integration Technologies Adoption

2.4.1 Current Research on EAI Adoption in LGAs

LGAs are complex organisations and have developed their own structures and basic service delivery systems according to their requirements (Senyucel, 2005; Brennan and Douglas, 1998). Nye (1999) states that such LGA structures have been based traditionally on a bureaucratic model that emphasizes decentralisation and specialisation in a mechanical and pre-planned approach. LGA service delivery and administration has also tended to be organised in the same bureaucratic manner (Senyucel, 2005). Due to the bureaucratic nature and the culture, LGAs have been experiencing from what may be termed as – IT lag time (Beaumaster, 2002). The normative literature indicates that LGAs have experienced approximately ten years of lag time between the adoption of new technologies and IS and its acceptance and routinisation across the organisations (Danziger and Kraemer, 1986). This shows that LGAs are laggards in adopting new IT solutions (Themistocleous *et al.,* 2004).

Literature indicates that laggards can be characterised as those who adopt technology(s) only when they have no choice (Roger, 1983). Several laggards do not explicitly adopt IT at all, but rather acquire them accidentally when a particular IT is a component of a packaged solution (Rogers, 1995). Laggards' innovation-decision process is relatively lengthy, with adoption and use lagging far behind the awareness-knowledge of a new idea. Resistance to new IT on the part of laggards may be entirely rational from the laggards' viewpoint, as their resources are limited, and they must be certain that a new idea will not fail before they adopt it. The adopters in the late majority group not only like to be certain that the new IT works, they also like to wait until it has been widely adopted and standardised. They do not consider that the IT offers them any competitive advantage, even though they recognise that they cannot continue without it once their partners or competitors have adopted it. The pressure of peers is necessary to motivate adoption. In this context, sometimes LGAs are forced to adopt new IT, as other LGAs may require them to adopt as well (Bingham, 1976). Thus, LGAs may be categorised in the late majority group (Figure 2.6). There might be an exceptional case where LGAs might be considered as innovators, i.e. cases where LGAs that have proactively adopted advanced or sophisticated IT to boost their economy (Devadoss *et al.,* 2002).

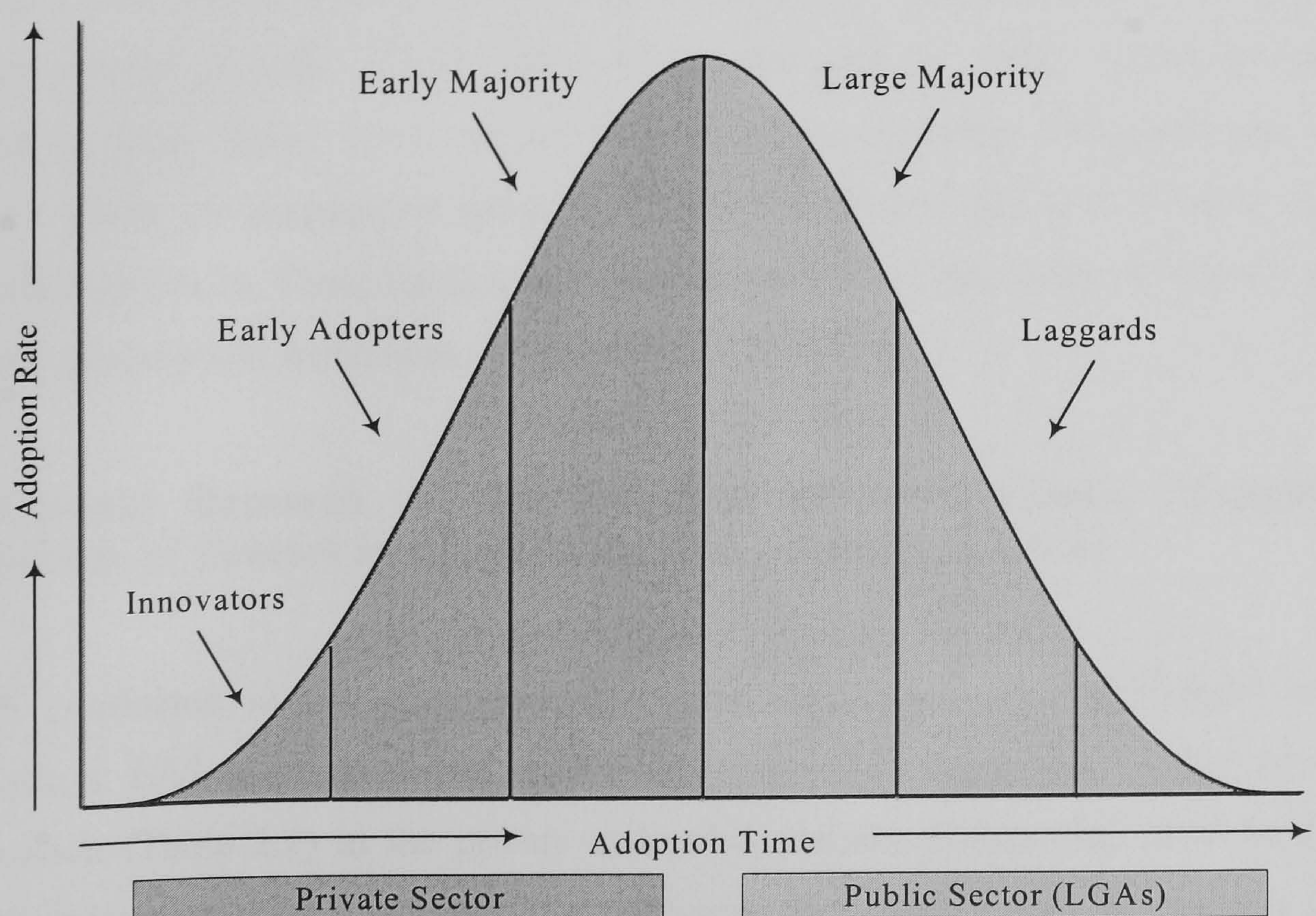

Figure 2.6: Adoption Life Cycle (Adapted: Rogers, 1995)

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). It can be said 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 LGA domain published in the normative literature (most of them discuss EAI in healthcare, SMEs and multinational organisations). The lack of published cases can be interpreted in many different ways. Some explanations may be that: (a) LGAs adopt new IT reactively compared to private organisations (Themistocleous, 2004), (b) lack of skilled staff and reluctant to adopt new technologies, (c) lack of understanding and knowledge of EAI in the LGAs, (d) LGAs have been very slow or even unprepared for technological transformations (Devadoss *et al.,* 2002; Beaumaster, 2002), (e) 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 still reluctant to adopt EAI unless they are forced to do so (Janssen and Cresswell, 2005). Other reason may also be that LGAs do not know whether and to what extent they should invest in EAI and they are unable to assess the return on these investments. The decisions taken in one LGA can have a profound influence on the activities, costs and benefits of other LGAs. Often the implications for 'other' LGAs are not clear, consequently these 'other' LGAs do not want to invest or change their processes to profit from EAI. There are discussions about how costs are divided and how benefits should be distributed over LGAs. These barriers may impede enterprise application integration adoption in the local government authorities.

2.4.2 Current Research on the Adoption Lifecycle Phases, Mapping and Prioritisation of Factors Involved in the EAI Adoption in LGAs

Research conducted in the enterprise application integration area highlighted including among others: EAI adoption models with each model exhibiting several factors influencing EAI adoption (Table 2.2) in the private and public domain (Mantzana, 2006; Khoumbati, 2005; Themistocleous, 2004). Literature indicates that factors can be viewed as sited exemplars that help extend the boundaries of process improvement, and their effect can be characterised as much richer if viewed within the context of their importance in each phase of the implementation process (Somers and Nelson, 2001). In the context of EAI implementation, Lam and Shankararaman (2004) were the first who proposed a methodology for EAI named as Enterprise Integration Methodology (EIM) with five stages: (a) understand the end-to-end business process, (b) map the process onto components, (c) derive the requirements, (d) produce the architecture and (e) plan the integration. EIM methodology has contributed to the enterprise application integration area as it underlines the importance of understanding business processes when integrating systems and stressing the need to map processes on existing software solutions.

According to Themistocleous and Irani (2006), EIM has limitations that it does not cover issues like systems' restructuring or the new software solutions that need to be developed, thus, in doing so, proposing an EAI methodology for the development of integrated IT infrastructures consisting of eight stages. These stages are: (a) planning, (b) scenarios building and evaluation, (c) business process reengineering, (d) systems restructuring, (e) requirements analysis, (f) filling the gap – new systems development, (g) integration and testing and (h) operation and maintenance. On the other hand, Reiersgaard *et al.,* (2005) also proposed a framework for EAI implementation process that is based on the enterprise experience cycle model with four stages such as: (a) chartering, (b) project, (c) shakedown and (d) onward and upward phase. The analysis of the EAI methodology and EAI framework illustrate several stages that specifically discuss on the implementation stages beyond the adoption phase.

Despite their contribution to the EAI area, the researcher does not cover up these stages in the context of this thesis. The intent is to map and prioritise the importance of factors influencing EAI adoption on different phases of the adoption lifecycle and not beyond the adoption phase. In the area of mapping EAI factors, 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 map and prioritise the importance of EAI adoption on different adoption lifecycle phases. In the context of prioritising factors, there is plethora of literature including among others: ranking the critical success factors influencing Executive Information Systems (EIS) implementation (Salmeron and Herrero, 2005), identifying and prioritising the importance of ERP project risk factors (Huang *et al.,* 2004). In spite of these research studies, none discuss on prioritising the importance of factors related to EAI adoption in the local government authorities.

Thus, it can be argued – despite the fact that the private and public organisation's decision to implement EAI may in fact be the most important development for integrating their heterogeneous IT infrastructures. To the best of the researchers' knowledge, there is lack of broad-based theoretical and empirical research on the mapping and prioritising the importance of factors that influence the decision making process for EAI adoption on different phases of the adoption lifecycle in LGAs. Integration is indeed a concern within the area of e-Government and perhaps particularly challenging for local government authorities (Lam, 2005; Janssen and Cresswell, 2005; Themistocleous and Sarikas, 2005). Thus, given the increasing attention to EAI adoption by academics (Mantzana, 2006; Khoumbati, 2005; Themistocleous, 2004), the researcher attempts to further investigate the adoption lifecycle phases, mapping and prioritisation of factors on different adoption lifecycle phases in the local government authorities. The necessity for relatively similar research has been highlighted in the normative literature (Janssen and Cresswell, 2005; Somers and Nelson, 2001; Prescott and Conger, 1995).

2.5 Conclusions

This chapter reviews the normative literature to identify research issues in the area of the local government authorities. In doing so, the researcher determines a gap in the literature dealing with the absence of theoretical models for EAI adoption in LGAs. The explanation for this is that EAI is a relatively new research area specifically in LGAs. Although, there exist few EAI adoption models, research on adoption of integration technologies in SMEs and large organisations and few research studies on EAI implementation in the government domain, however, the researcher conjectures that all these research studies may seem relevant but their validity and applicability in LGAs is questionable. The reason is that LGAs are complex organisations that differ from private and other public organisations. LGAs are managed by mandate and rules set by the central government, are influenced by other government authorities and ministries, have a bureaucratic nature and structure with commitment to outmoded cultural values, and their IS adoption involve distributed decision-making based on a division of control and powers. With these evidences theorised in the normative literature, it can be said that a void exists regarding EAI adoption models in the local government authorities.

The chapter begins by reviewing the literature on IT adoption in LGAs. The researcher discusses on the focus of LGAs on IT adoption during the last decades. For this purpose the researcher exhibits a timeline that illustrates the focus of IT adoption in LGAs. The review of IT adoption in LGAs reveals that although LGAs have adopted several IT systems to improve their operational practices, however, still many problems exist. Moreover, the researcher identifies several limitations in LGA IT infrastructures. These limitations are based on the literature findings from several research studies conducted on the public domain. As EAI is a relatively new research area with limited literature in LGAs, to provide a better understanding on this area, the researcher initially explains EAI, followed by EAI business and technical perspectives. These perspectives exemplify several benefits (as well as some arguments against the benefits) and how EAI may be able to improve the IT infrastructures in the local government authorities.

Thereafter, the researcher highlights the current research conducted on EAI adoption in the private and public domain. Section 2.4 presents several EAI and integration technologies adoption studies in the private and public domain. These research studies epitomize multiplicity of factors i.e. several common and various other domain specific factors (Table 2.2). The explanation presented in Sections 2.4.1 and 2.4.2, strengthens the researcher's research findings and the research issues thus so far. Therefore, the main research issues derived from the literature review conducted in this chapter are summarised in Table 2.3:

Research Issues for Further Investigation	
Research Issues	**Description**
EAI Adoption Models	• Lack of enterprise application integration models in the local government authorities.
Mapping EAI Adoption Factors on Adoption Lifecycle Phases	• Existing enterprise application integration models do not map the influential factors (Table 2.2) on different phases of the adoption lifecycle.
Prioritising EAI Adoption Factors on Adoption Lifecycle Phases	• Existing enterprise application integration models do not prioritise the factors (Table 2.2) based on their importance on different phases of the adoption lifecycle.

Table 2.3: Highlighting the Research Issues

These research issues are taken into consideration and addressed in Chapter 3.

3

Chapter 3: Developing a Conceptual Model – EAI Adoption in LGAs

Summary

The previous chapter highlighted some research issues for further investigation. The main research issues derived from Chapter 2 emphasised that: (a) the theoretical models that describe EAI adoption in LGAs are limited thus, a relative void exists for investigating enterprise application integration adoption in the local government authorities, (b) the private and public sectors have different organisational structure, culture and decision making process compared to LGAs thus, it may be possible that LGAs focus on different factors when taking decisions for the adoption of EAI, (c) existing enterprise application integration models do not map the influential factors (Table 2.2) on different phases of the adoption lifecycle and (d) existing enterprise application integration models do not prioritise the factors based on their importance on different phases of the adoption lifecycle. The researcher uses the critical analysis of the literature reported in Chapter 2 to further analyse the area under study. Thus, to further investigate these research issues, this chapter aims to develop a conceptual model for enterprise application integration adoption in the local government authorities.

Section 3.1 focuses on the theory development for this research i.e. investigating factors influencing EAI adoption in LGAs by reviewing existing EAI adoption models. Section 3.1.1 describes several common factors identified from the previous section. This section assists in building an understanding of how existing EAI adoption models have been developed in different sectors. Section 3.1.2 investigates factors from the government literature that may assist in providing support in developing EAI adoption model in LGAs. These factors are described in detail for their better understanding and applicability in LGAs. The proposed factors make a novel contribution at the conceptual level (Section 3.1.3). As reported in Section 2.4.2, literature illustrates that: (a) none of the previous studies on EAI adoption attempted to investigate on factors that influence EAI adoption on adoption lifecycle phases and (b) there is lack of research studies that prioritise the importance of EAI adoption factors on adoption lifecycle phases in LGAs, thus, indicating a gap in the literature.

Therefore, on further investigating these literature voids i.e. lack of literature evidence on the factors influencing EAI on the adoption lifecycle phases and prioritisation of factors; initially Section 3.2 investigates and presents the adoption lifecycle phases. In doing so, proposing a research issue in Section 3.2.1 based on the theory of mapping of the factors influencing EAI adoption on different phases of the adoption lifecycle. However, the actual mapping of factors at each phase of adoption lifecycle will be carried out after conducting empirical research. Thereafter, in Section 3.3 the researcher focuses on the theory development on the prioritisation of factors, whereas, in Section 3.3.1 proposing a research issue based on prioritising the importance of factors influencing EAI adoption in LGAs on different phases of the adoption lifecycle. This section assists in building an understanding of how existing literature prioritises the factors. In piecing together the factors, adoption phases, theory of mapping and prioritisation of factors on different phases of the adoption lifecycle, a conceptual model to study EAI adoption in the local government authorities is proposed in Section 3.4 and summarising the conclusions in Section 3.5.

3.1 Investigating Factors for EAI Adoption in the Local Government Authorities

Technological adoption has been an important area for IS research and practice (Fichman, 1992). Several studies on technology adoption and integration technologies adoption indicate different influencing factors e.g. organisational, technological (Mantzana, 2006; Khoumbati, 2005; Themistocleous, 2004; Darmawan, 2001). The researcher argues that such factors may be specific to one sector and not applicable in other sectors. As a result, additional factors may be required particular to a context. Literature indicates that such factors merely by themselves are unlikely to be strong predictors for technology adoption and thus, need additional factors according to a particular environment (Fichman, 1992). Therefore, as LGAs are different types of organisations compared to other sectors (Ward and Mitchell, 2004), the researcher specifies that additional factors may be necessary from the government literature.

According to Kurnia and Johnston (2000) any adapted model needs to be refined and tailored to match the context it is applied to. Thus, based on the review of EAI and integration technologies adoption studies from Section 2.4, this research uses the factor-oriented approach (Kurnia and Johnston, 2000) for investigating EAI adoption in LGAs. As an emerging technology, EAI has not been widely investigated in LGAs. To the best of the researcher's knowledge, the model proposed by Themistocleous (2004) is the foremost available source of reference in this area. Other existing EAI and integration technologies adoption models illustrate specific factors relating to their field (e.g. see Section 2.4). All these studies incorporated some factors (e.g. benefits, barriers, costs, IT sophistication, external pressures, internal pressures, IT infrastructure, support, evaluation framework) from Themistocleous (2004) EAI adoption model. Thus, due to the absence of theoretical models for EAI adoption in the local government authorities, Themistocleous (2004) EAI adoption model (Figure 3.1) is considered as an appropriate basis model to study EAI adoption in LGAs.

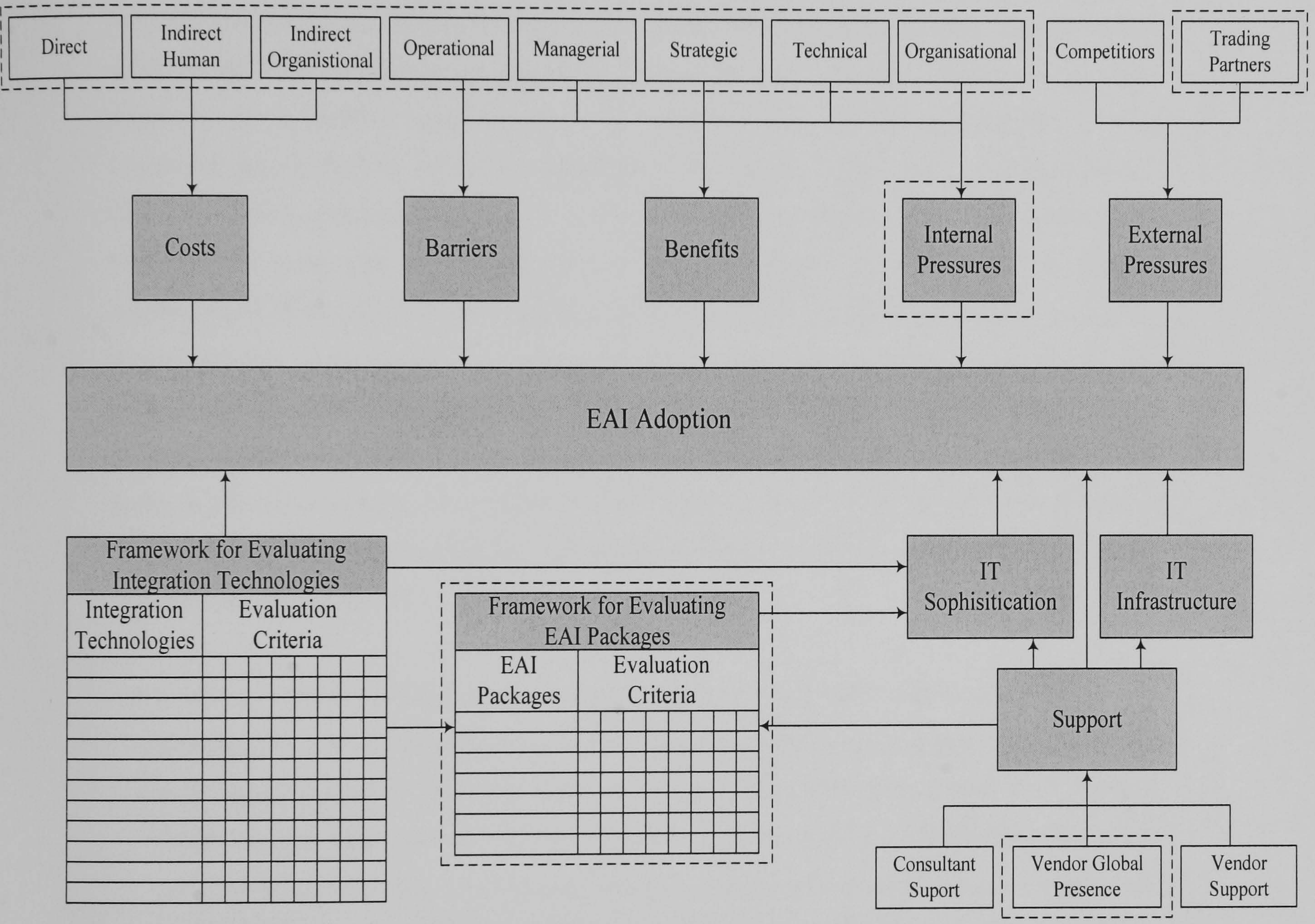

Figure 3.1: EAI Adoption Model in Multinational Organisations (Source: Themistocleous, 2004)

3.1.1 Investigating Common Factors Supporting EAI Adoption

The normative literature indicates that Mantzana (2006) and Khoumbati (2005) incorporated factors from Themistocleous (2004) EAI adoption model as common factors. However, Chen's (2005) research on SMEs and large organisations indicate that in large organisations factors such as: (a) framework for evaluating integration technologies and (b) framework for evaluating EAI packages are important adoption factors, whereas, in SMEs, these factors may not be important (Chen, 2005). The reason may be that SMEs may have different integration needs (e.g. focus on external forces) compared to large organisations (e.g. focus on internal needs). For example, Chen (2005) reports the adoption factors for SMEs are the perceived industry pressure and perceived governmental pressure, as focused on external forces.

Furthermore, looking at the adoption factors for large organisations, they are focused on different aspects of why large firms adopt integration technologies, such as technical issues (e.g. complexity, evaluation of integration technologies and packages), internal needs to improve their services. This shows that the factors for SMEs emphasised the external forces, whereas the large organisations are more focused on their internal needs to solve their problems or to improve their services (e.g. internal needs, technology evaluation). The researcher reports that all the factors reported earlier may be considered as common factors influencing EAI adoption. The reason is that these common factors have been empirically evaluated in more than 30 case studies in different sectors e.g. private and healthcare organisations, thus, may also be considered as important factors for EAI adoption in LGAs. In this section, these factors are examined for the suitability for their inclusion in the conceptual model for EAI adoption in LGAs. Although it is acknowledged that the adoption process varies from organisation to organisation (Fichman, 1992), it is anticipated that the analysis and identification of common factors identified from existing EAI research studies may provide broad applicability for EAI adoption in LGAs. The description of the common factors is described below:

- **Cost:** Literature indicates cost as a significant factor and many organisations perform a cost benefit analysis before taking any important decision regarding their investment for technology adoption (Themistocleous, 2004). In the context of EAI, Lee *et al.,* (2003) report that the basic concept of EAI is mainly in it externality of enterprise integration with lower cost and less programming using existing applications, whereas a significant benefit of EAI is the reduction of overall integration cost (Puschmann and Alt, 2001). Themistocleous (2004) reported cost as a factor and categorised EAI adoption costs as direct costs, indirect human costs and indirect organisational costs. Wu (2004) also reported cost as a factor, and considered cost as financial resources readiness. In addition, Wu (2004) reports financial resources readiness as an initial cost required for the adoption of web services. On the basis of the above-mentioned arguments the researcher considers costs as an influential factor for EAI adoption in the local government authorities.

- **Barriers:** Literature indicates that EAI adoption presents a similar case to ERP systems in terms of its barriers (Themistocleous, 2002). Like ERP systems, EAI: (a) promises to integrate IT infrastructures, (b) introduce changes to the organisational structure and the way of doing business, (c) influences the employees tasks as well as inter-organisational relationships, (d) it costs a lot of money and (e) is more likely adopted by big organisations. Since there are a lot of failures on ERP adoption (Songini, 2004; Hong and Kim, 2002; Davenport, 1998), organisations tend to estimate the possible impact of EAI adoption before proceeding to its adoption. Barriers are also reported by Ngai and Gunasekaran (2004), Jun and Cai (2003), and Chwelos *et al.* (2001) as a factor that influences the adoption of EDI technology. Similarly, Wu and Sawy, (2003), Estrem (2003), and Fremantle *et al.,* (2002) reporting barriers as an influential factor for web services adoption. It appears from the aforesaid evidences that barrier as a factor has been significant in the adoption of different integration technologies. Thus, the researcher suggests that barriers may also be considered as an influential factor for EAI adoption in the local government authorities.

- **Benefits:** Benefits refer to the level of recognition of the advantages that the integration technologies could provide to the organisation. Iacovou *et al.*, (1995) classified perceived benefits into direct and indirect. Direct benefits were mostly operational saving-related (e.g. reduced transaction cost) and indirect benefits were mostly tactical and competitive advantages that had an impact on business process and relationships (e.g. increased operational efficiency). Similarly, Waarts *et al.*, (2002) represented benefits as an advantage, and it is the sub-factor of perceived innovation characteristics. Bradford and Florin (2003) report benefits as organisational benefits that include the facilities for the integration problems, real-time planning, user satisfaction and support to quick customer response. In addition, Themistocleous (2004) extended benefits to cover: (a) operational benefits (e.g. increase productivity, reduce cost and reduce lost sales), (b) managerial benefits (e.g. increase performance, improve data quality, and support decision making), (c) technical benefits (e.g. increase flexibility, reduce redundancy, achieves process integration and results in reliable data), (d) strategic benefits (e.g. achieve customers' stratification and return on investment) and (e) organisational benefits (e.g. allow organisation to do business effectively). Wu (2004) and Chen (2003) reported benefits as relative advantage and categorised this as a sub-factor of perceived innovations. Therefore, the above analysis gives sufficient justification to the researcher to consider benefits as an influential factor for EAI adoption in the local government authorities.

- **Internal Pressures:** This factor has been widely reported in the normative literature related to integration technology adoption models (Chen, 2003). Kuan and Chau (2001) have not reported this as an independent factor, but they have discussed it in the context of the pressures on IT managers. According to Kuan and Chau (2001), IT managers have pressures by the management to get full utilisation and benefits of existing IT resources. Therefore, these pressures lead to the adoption of integration technology. According to Themistocleous (2004), organisations turned to EAI adoption for many reasons, including technical, managerial, financial and strategic. Therefore, these reasons present internal pressures for the adoption of EAI. As a result, Themistocleous (2004) considered this as factor for EAI adoption. Chen (2003) has represented internal pressures as stakeholder influences for the adoption of web services in the organisation. Stakeholders include the individuals working in the organisations such as systems integrators; thus, their influence representing internal pressure. Hence, the researcher considers internal pressures as an influencing factor for EAI adoption in the local government authorities.

- **External Pressures:** External pressures refer to the influences from the external business environment. Kuan and Chau (2001) reported external pressures as industry/government pressures for integration technology adoption. Their findings indicate that the pressures come primarily from the government's plan to terminate all the paper-based submission of import and export declarations. As a result, this forces the organisations to adopt integration technology. Waarts *et al.,* (2002) reported external pressures as external environment characteristics, which include industry competitiveness and suppliers competition. The results of their research indicate that dependence on parent companies; industry competitiveness and supply-side activities seem to be more important in influencing the adoption of ERP in the organisations. Bradford and Florin (2003) have also identified external pressures as a factor for ERP adoption. Therefore, organisations seek new practices to better co-ordination cross-enterprise business processes, which translate into a factor that influences EAI adoption. Chen (2003) represents this factor as collaboration with stakeholders' that includes close collaboration with customers, suppliers and IT product vendors. Chen (2003) reported that many SMEs are forced by their supplier or customers for close collaboration; as a result, many businesses to businesses integration project are being implemented due to this reason. Thus, all the above facts provide sufficient reasons for considering external pressures as an influencing factor for EAI adoption in the local government authorities.

- **IT Infrastructure:** The term IT infrastructure refers to the part of the infrastructure of an organisation that forms a platform for the IT applications (Shaw, 2000). IT infrastructure consists of the computer systems and the supporting software needed to develop, manage and operate IT applications, such as operating systems, database management systems, development tools and management tools (Shaw, 2000). However, the non-integrated nature of IT infrastructure in organisations causes integration problems. Thus, raising the need for integration in the organisations. As a result, several researchers have reported IT infrastructure as a factor in their integration technologies adoption models. Waarts *et al.*, (2002) characterise IT infrastructure as a sub-factor of adopter factors, and represent this as IT resources in the organisations. Their research findings indicate that having larger IT resources in the organisation for the adoption of ERP does not distinguish between the early adopter and late adopter organisations. Bradford and Florin (2003) also characterise IT infrastructure as technical compatibility. This refers to an innovation's compatibility with existing IT infrastructure. IT infrastructure includes the organisation's existing software and hardware that need to be integrated with the ERP systems. Themistocleous (2004) reported that the non-integrated IT infrastructure causes many problems to organisations, such as technical, strategic and operational. Thus, motivating the organisations to integrate their IT infrastructure. On the basis of these arguments, the researcher considers IT infrastructure as an influential factor for EAI adoption in the local government authorities.

- **IT Sophistication:** IT sophistication is reported as an influential factor in integration technologies adoption models. The research findings on integration technology adoption Chwelos *et al.,* (2001) represent that organisations with sophisticated IT resources will be likely to be adopters of integration technology. However, Iacovou *et al.*, (1995) have not reported this as an independent factor, but have considered this as a dimension of the organisational readiness factor in their model of integration technology adoption. In the context of EAI adoption, Themistocleous (2004) has reported IT sophistication as a factor in his model. This is due to the level of understanding in addressing technical problems at an enterprise and cross enterprise level. In addition, Wu (2004) has also reported IT sophistication as a factor, and represented this as technological skills readiness. According to Wu (2004), technological skill readiness is concerned with the level of required knowledge of IT personnel for the adoption of web services. As a result, organisations with higher technological skills will lead to greater intentions to adopt web services. Thus, the aforesaid findings provide sufficient justification to consider IT sophistication as an influencing factor for EAI adoption in the local government authorities.

- **Support:** Literature indicates support (e.g. vendors, consultants etc) as a factor that influences EAI adoption (Themistocleous, 2004). The reason is that the EAI adoption requires organisations to invest considerable amount of moneys on their IT infrastructure (both hardware and software) (Stal, 2002). Therefore, it is essential for organisations to have support from vendors and consultants. Themistocleous (2002) report that support factor affects the introduction of EAI in organisations. This issue has been well investigated and verified through various case studies. For example, consultants' support is an important parameter that affects EAI adoption. As reported in several case studies, consultants supported the IT department to introduce and evaluate EAI in organisations (Themistocleous, 2004). In doing so, supported and influenced the decision-making process. Moreover, support factor improved IT sophistication and enhanced the organisations' knowledge regarding applications integration and EAI. Vendors' support has a correlation with IT infrastructure since vendors provide services (e.g. maintenance) to the organisations. As reported in several case studies the: (a) close relationships between one organisation and its hardware vendors and, (b) the dependence of the other organisation on the vendor's solution (hardware), influenced the decision for purchasing EAI package from the vendor (Themistocleous, 2004). This indicates how vendors' support may influence the decisions for adopting EAI solutions. Themistocleous *et al.,* (2005) report that since LGAs have insufficient knowledge on different EAI packages, and seek for vendors and consultants that can support them e.g. for technical support. Therefore, support can be considered as an influential factor for EAI adoption in the local government authorities.

- **Evaluation Frameworks:** The integration marketplace is extremely complex with a diversity of EAI products and technologies solving different types of problems. In addressing this issue, Themistocleous and Irani (2003) proposed two evaluation frameworks, which can be used by organisations to assess EAI packages and technologies. Evaluation frameworks such as: (a) framework for evaluating integration technologies and (b) framework for evaluating EAI packages. These frameworks highlight a possible combination of integration technologies and tools and EAI packages that can be used to integrate IT infrastructure. Therefore, these evaluation frameworks facilitate organisations to overcome the confusion regarding the selection of integration technologies and EAI packages. Such frameworks may be considered as a tool to support decision-making for EAI adoption in the local government authorities.

3.1.2 Investigating Other Factors Influencing EAI Adoption in LGAs

In the previous section, eight factors are identified as common factors that play an important role in EAI adoption. The analysis of the aforesaid factors illustrate that they cover the broad scope of the organisation in different sectors. These factors provide sufficient support to the researcher to consider them for the development of EAI adoption model in LGAs. In the context of this thesis, the researcher also investigated the literature on government area, by which several other factors were identified, that may support in developing a conceptual model for EAI adoption in LGAs.

Other factors identified are: (a) formalisation (Ebrahim *et al.,* 2004; Lee *et al.,* 2003; Serour and Henderson-Sellers, 2002), (b) centralisation (Ebrahim *et al.,* 2004; Melitski, 2003; Reich and Benbasat 1996), (c) managerial capabilities (Senyucel, 2005; Kim and Bretschneider, 2004; Mohr, 1969), (d) project championships (Somers and Nelson, 2004; Akbulut, 2002; Garfield, 2000; Norris, 1999), (e) IT capabilities (Akbulut, 2002; Norris, 1999; Perry and Danziger, 1980), (f) technology risks (Ebrahim and Irani, 2005; Gil García and Pardo, 2005; Sjöberg and Fromm, 2001; Sumner, 2000), (g) data privacy and security (Lam, 2005; Signore *et al.,* 2005; Warkentin *et al.,* 2002), (h) higher administrative authority (Kim and Bretschneider, 2004; Moon and Bretschneider, 1997), (i) return on investments (Irani and Love, 2002; Janssen and Cresswell, 2005), (j) financial capability (Kamal, 2006; Kim and Bretschneider, 2004; Akbulut, 2002; Mohr, 1969), (k) critical mass (Akbulut, 2002; Chwelos *et al.,* 2001; Bouchard, 1993; Bingham, 1976), (l) market knowledge (Rajagopal, 2002; Hong and Kim, 2002; Johannessen, 1994; Lee and Treacy, 1988), (m) citizen satisfaction (Beynon-Davies, 2005; Kim and Bretschneider, 2004; Beynon-Davies and Williams, 2003), (n) organisational size (Akbulut, 2002; Brudney and Seldon, 1995; Bingham, 1976), and (o) top management support (Kamal, 2006; Colmenares, 2004; Nah *et al.,* 2001).

All these factors have been well analysed and reported in the government literature. For example, Norris (1999) reports that the existence of a project champion is one of the most important facilitators in the adoption of technologies by the local government authorities. Similarly, the success of technological innovations has often been linked to the presence of a champion who performs the crucial functions of transformational leadership, facilitation, and marketing the project to the users (Akbulut, 2002). After critically interpreting the literature, the researcher reports that identifying additional factors that may influence EAI adoption in LGAs is a contribution to theory in the area of EAI and LGAs. The researcher further emphasizes that with the identification of additional factors, the reliability of this research on Themistocleous's (2002) EAI adoption model as the basis for developing EAI adoption model is lessened. However, the intention of these new factors is explained and manipulated in the light EAI adoption in LGAs. These factors may be considered for the development of EAI adoption model in LGAs. These factors are described as below:

- **Formalisation:** Formalisation refers to the existence of clear procedures, norms and formal processes for carrying out organisational tasks more effectively and efficiently

(Ebrahim *et al.*, 2004; Lee *et al.*, 2003). Ebrahim *et al.*, (2004) reports formalisation as an organisational factor that is internal to the public sector, which influences the adoption and design of e-Government applications. The interaction between public sector organisations and e-Government applications might be complex if organisations are not established enough to deal with new applications. According to Serour and Henderson-Sellers (2002) innovation adoption provides challenges to organisations due to the fact that innovation adoption not only addresses changes in technology and systems but also deals with the need for changing the way an organisation runs its business in terms of processes, workflows, policies, procedures, and structure (Ebrahim *et al.*, 2004). This illustrates that highly formalised processes that create a structured environment would be useful for systems planning and information processing (Ebrahim *et al.*, 2004; Lee *et al.*, 2003). In addition, the researcher also states that written procedures and more formal environment will eliminate any ambiguities, and this may facilitate EAI adoption. Thus, formalisation may play an important part in EAI adoption in the local government authorities since formalisation may constrain or facilitate the adoption process.

- **Centralisation:** E-Government initiative have prompted many public sector organisations to rethink about their IT strategies and the way they design and manage their business processes to provide more cohesive and responsive services to the public (Ebrahim *et al.*, 2004; Melitski, 2003). As with many IT projects, one of the anticipated benefits of e-Government is improving efficiency by reducing errors and improving the consistency of outcomes through automating standardised tasks. In addition, IT managers believe that the e-Government projects will increase efficiency and effectiveness of organisation and save money through increased centralisation of resources (Melitski, 2003). Centralisation refers to the degree of power or decision-making authority in organisations and encompasses participation in decision-making and authority hierarchy (Reich and Benbasat 1996). In centralised organisations, decision-making is typically concentrated at the top level of hierarchy while in decentralised structures decision-making is distributed across different hierarchical levels (Bretschneider and Wittmer, 1993). Since the decision-making for technology adoption is typically concentrated at top level of management in public sector organisations (Kamal, 2006; Ebrahim *et al.*, 2004), hence, the degree of centralisation may influence EAI adoption in the local government authorities.

- **Managerial Capability:** The availability of personnel who have ample competencies for producing new ideas is one of the significant factors for IT adoption (Beaumaster, 2002; Mohr, 1969), and innovations are likely to be proposed by personnel who have expertise in a particular discipline (Daft, 1978). Especially, IT adoption tends to start from ingenious application devised by managers with a technical background (Kim and Bretschneider, 2004). Therefore, managerial capability, which can be defined as the ability of managers to identify problems of the current systems, and to develop and evaluate alternatives to improve the IT infrastructure of the organisation, appears to be important. However, Senyucel (2005) argues that some managers are not realistic in their demands regarding IT infrastructure, which can be traced back to an inward-looking approach in the literature. This was attributed to some managers still having difficulties seeing the long-term benefits of e-Government. Several departmental managers were seen as highly suspicious of new initiatives and unsupportive. Such managerial shortsightedness has the potential to jeopardise the success of e-Government facilitation. Senyucel (2005) also suggests that the managerial resistance in particular, has emasculated the application of the idea of e-Government at the local level. These theorised conceptions illustrate that managerial capability can be considered as an important factor that may influence EAI adoption in the local government authorities.

- **Project Champion:** Championship refers to the existence of a person in the organisation who is committed to introduce IT initiative to the organisation. The literature on strategic uses of IT suggests that a very important antecedent to a successful adoption and implementation of critical information systems is a *'champion'* for the new system (Gopalakrishnan and Damanpour, 1997; Reich and Benbasat, 1996). Project champions are personnel who actively and vigorously promote their personal vision for using IT, pushing the project over or around approval and implementation hurdles (Beath, 1991). Similarly, Garfield (2000) reported that in inter-organisational information systems the presence of an internal sponsor in each participating organisation is very important in providing the necessary leadership as the existence of a system-wide sponsor is not always sufficient. Norris (1999) and Beath (1991) reported that within government organisations, the existence of a champion is one of the most important facilitators in the adoption of technologies. Project champions play a critical role in the acceptance of technology and, to a lesser extent, during its use and incorporation into the organisation (Somers and Nelson, 2004). Thus, project champions may influence EAI adoption because of their skills in bringing about organisational change in the local government authorities.

- **IT Capabilities:** IT capabilities refer to the level of: (a) IT infrastructure, (b) personnel IT knowledge, and (c) IT sophistication of an organisation (Akbulut, 2002). The ease of use and access of adequate equipment in the organisation is a major determinant of adoption of new technologies. In addition, the available skill set of the personnel is an important factor that constraints the introduction of new technologies. Perry and Danziger (1980) reports that one of the most important factors in the adoption of computer applications by local government is staff competence. Norris (1999) reports that the government organisations argued that their employees were not very well trained in using information technologies and this inadequate training resulted in resistance to change, resistance to use, and under utilisation of computers. Lastly, IT sophistication assesses the level of management understanding and support for using IT to achieve organisational objectives (Chwelos *et al.,* 2001). Therefore, higher levels of IT capabilities may influence EAI adoption in the local government authorities.

- **Technology Risks:** Risks related to technology are becoming a focus of concern (Sjöberg and Fromm, 2001). This is because the risk and uncertainty associated with IT can make risk-averse managers require higher, not lower, rates of return before they invest. Risk is a problem that has not yet happened but that could cause some loss or threaten the success of IT project if it did (Wiegers, 1998). A number of research studies have investigated the issue of the relative importance of various risks in IT projects and have attempted to classify them in various ways (Sumner, 2000). Much has been written about the causes of IT project failures. Poor technical methods are only one of the causes and this cause is relatively minor in comparison to larger issues such as failures in communications and ineffective leadership. In addition, studies dealing with technology risk factors in IT projects have described issues e.g. organisational fit (Barki *et al.,* 1993) and technology planning (Ewusi-Mensah, 1997). Moreover, security is an ongoing risk associate with most of IT projects and in terms of e-Government, the degree of risk is escalating as the use of public networks increases together with databases that hold citizens profiles and government information (Ebrahim and Irani, 2005). However, understanding and reducing risk in e-Government initiatives is a high priority for both researchers and practitioners (Gil García and Pardo, 2005). One consequence of attention to risk is that organisations, both public and private, are increasing their investments in standard tools for planning and managing IT initiatives. This makes technology risk an important factor for consideration for the LGAs decision-makers before they take their decisions for EAI adoption.

- **Data Security / Privacy:** Security and privacy of citizens' data has always been important (Signore *et al.,* 2005). Trust and confidence between users and government is recognised as a critical success factor in the adoption of e-Government (Warkentin *et al.,* 2002). However, e-Government adoption is blocked by several security architectures that have been identified as a barrier in integrating e-Government systems (Lam, 2005). For example, applications that have evolved autonomously rather than as part of an overall architecture inevitably end up having their own security architecture that is often incompatible with that of other applications (Volchkov, 2001). Key security functions, such as authentication, authorisation, confidentiality and non-repudiation are managed according to the application's own specific set of rules, and thus present a significant challenge to the definition of a single security administration function across an integrated e-Government solution (Lam, 2005). In addition, citizens' concern on privacy and confidentiality of the personal data has been a critical obstacle in implementing e-Government projects (Signore *et al.,* 2005; Tillman, 2003). While integration of e-Government systems encourages the sharing of data between government agencies, nonetheless, this must be done so in a controlled and transparent manner that protects sensitive information, and in some cases, citizen identity e.g. home addresses, tax credits history, debts (if any) details, funding and benefits (Lam, 2005). The researcher asserts that access to such information must be controlled because disclosure to irrelevant users may cause problems for citizens' privacy. Thus, there is a need for a technology that provides more appropriate security and privacy approaches to the local government authorities.

- **Higher Administrative Authority:** Improving LGA technological facilities depends on whether support from higher administrative authorities elected or appointed top administrators, LGAs and also the central government is available for IT managers who are in charge of implementing technology adoption process and its utilisation (Tolbert and Zucker, 1983). Kim and Bretschneider (2004) report that even in the case that IT managers initiate technology adoption, support from higher administrative authorities may play a significant role. Support from higher administrative authorities can be expressed as: *Firstly,* top administrators' innovativeness is important for mobilising the resources. Adopting new technology requires huge investments, and its effects are not realised in a short term. To implement technology, top administrators are expected to take the risk of failure or delay of technology adoption. Therefore, the top administrator has to have risk-taking tendency to support IT managers to design and implement technology adoption plan without worrying about the results (Kim and Bretschneider, 2004). *Secondly,* administrators' knowledge of technology should be considered. Administrators knowledgeable of the potentials of technology are more likely to have more positive attitude to technology adoption and to endorse the initiatives raised by IT managers. *Thirdly,* legislative body i.e. LGA is as important as top administrators, as budget allocation and other legislative supports are finally authorised by LGAs. Like top administrators, LGAs technology and knowledge form a crucial part of support from higher administrative authorities. *Fourthly*, the central governments' influence also needs to be considered. The central government makes efforts for state-wide technology diffusion, e.g. providing information on technology, financial support during development, and procedural facilitation (Moon and Bretschneider, 1997). However, all such evidences endorse the significance of higher administrative authority and moreover may assist in EAI adoption in the local government authorities.

- **Return on Investment (ROI):** Organisations are often reluctant to proceed with new investments before justifying its costs and expected benefits (Irani and Love, 2002). In the context of LGAs, ROI is important (Janssen and Cresswell, 2005). The reason is that technology budgets of LGAs at times are much lower as compared to other private and public organisations (Ward and Mitchell, 2004). Wagnar and Antonucci (2004) report that within LGAs budgets are often reduced and sometimes allocated with appropriations. Lam (2005) also reports that government organisations face difficulties in obtaining the level of funding requested, especially if funding is drawn from a funding pool that is meant to serve multiple initiatives. As a result, they do not want to invest more in technology, without significant ROI. In addition, in the public sector there is often confusion about the potential of IT and there is an absence of IT know-how at senior management levels (McIvor *et al.*, 2002). Beynon-Davies and Williams (2003) found that in the UK there is not enough emphasis on the engineering of both business processes and systems. Irani *et al.*, (2003) state that decision-makers not only require the skills to evaluate the elements of the technology, but also to assess its impact on the future of the organisation. The researcher reports that none of this literature focuses on LGA reengineering by making the business case to support decision-making on whether to and how to implement EAI. The rationale is that EAI technology is less explored in LGAs. Due to this, LGA officials also do not know whether and to what extent they should invest in EAI and they are unable to assess ROI (Janssen and Cresswell, 2005). Thus, the researcher regards this as a factor for EAI adoption in the local government authorities.

- **Financial Capability:** Financial capability refers to LGAs capital available to bear the cost for technology adoption. The availability of financial resources to enhance or build organisational IT infrastructure is one of the strongest predictors of innovation (Mohr, 1969). For organisational innovation, especially for adopting advanced technologies (e.g. EAI), financial capability is indispensable for procuring and developing adequate levels of hardware and software, and training end-users as needed. Ross and Beath (2002) and Sambamurthy and Zmud (1999) assert that investments in IT may be aimed at changing the IT infrastructure to support future innovation. Therefore, it can be expected that a large variation in IT innovation between private and government sector organisations can be explained by the amount of budget available in adopting new IT. However, as the size of the total budget differs from organisation to organisation, the relative proportion of the IT budget in the budget structure could be considered as the criteria to judge the level of financial capability (Kim and Bretschneider, 2004). Akbulut (2002) also states that organisations that have slack resources can afford costly innovations, can absorb failure, and can explore new ideas in advance of the actual need. However, with such theorised conceptions, the researcher asserts that higher levels of financial capability may influence EAI adoption in the local government authorities.

- **Critical Mass:** Research on critical mass has shown that central government and LGAs are affected by the actions of other governments in IT adoption (Akbulut, 2002). For example, cities adopting innovations were located in close proximity to other innovation-adopting cities (Bingham, 1976). This showed that organisations were affected by the actions of other organisations that were similar in terms of size and budgetary constraints. Bouchard (1993) reports these actions as *'critical mass theory'*. The benefit of having a critical mass of organisations adopting same technology is one aspect of inter-organisational relationships and IT adoption (Chwelos *et al.,* 2001). Critical mass may also be related to enacted power. Enacted power may be referred to as when one organisation encourages or coerces its trading partner or other organisations to adopt a specific technology (Chwelos *et al.,* 2001). Thus, the researcher considers critical mass as an influential factor for EAI adoption in the local government authorities.

- **Market Knowledge:** A majority of successful IT adoption cases are referred to the recognition of demands in the market. Lee and Treacy (1988) report that an unstable organisational environment generates increased potential for IT adoption. This requires an organisation's intent on being up-dated and well informed about the changes in market environment. Johannessen (1994) reports that contact with environment through development of external IS, for example, can reduce the insecurity for the individual organisation. Thus, the need for technological adoption or major changes in organisation's IT infrastructure generates a demand for technology in order to ease the adoption processes. Technology and IS adoption process remains costly and difficult to implement. Yet, there has always been a rush to adopt the latest technology to improve capability and performance within an organisation's marketplace (Rajagopal, 2002) or indeed, for government mandates for the pursuit of integrated government infrastructures e.g. e-Government. For example, ERP has been adopted by several public and private organisations often in haste and without market knowledge, to address integration and system uniformity problems (Hong and Kim, 2002). Due to this, often organisations were not gaining the benefits (e.g. improvements in operational efficiency) that motivated them to make large investments in ERP systems (Songini, 2004; Davenport, 1998). Therefore, higher levels of market knowledge on different integration solutions and external environment may positively influence EAI adoption in the local government authorities.

- **Citizen's Satisfaction:** Citizen's satisfaction has a significant impact on the performance of LGAs (Welch *et al.,* 2005; Moon, 2003). In addition, citizen satisfaction plays an important role in the growing push towards accountability between the LGAs. Literature indicates that IT adoption in LGAs is viewed as a central part of the modernisation of LGAs in improving the quality of LGAs services and achieving citizen satisfaction (Beynon-Davies, 2005; Kim and Bretschneider, 2004; Beynon-Davies and Williams, 2003). Welch *et al.,* (2005) and Moon (2003) report that IT appears to offer a useful opportunity to government to enhance citizen satisfaction by improving procedural transparency, cost-efficiency and effectiveness. While it is too early to judge immediate and clear contribution of IT to the restoration of citizen confidence, it is fair to state that IT provides governments with tremendous opportunities for improving administrative transparency, efficiency, and effectiveness of governmental performance (Moon, 2003). However, the non-integrated IT infrastructure in LGAs has caused problems in providing high quality services and achieving higher citizen satisfaction (Lam 2005; Signore *et al.,* 2005; Beaumaster, 2002). The researcher reports that all such evidences illustrate that citizen satisfaction has become an issue for service providers. The reason is that it is not only just a matter of citizens feeling good about the services they have received. It is the non-integrated IT infrastructure in LGAs that has caused problems and not providing quality services. Hence, the researcher considers citizen satisfaction as an influential factor for developing an EAI adoption model in the local government authorities.

- **Size:** Akbulut (2002) measures size in terms of the size of the community served and the number of the services provided by the organisation. In the central government and LGAs, organisational size was found to positively influence IT adoption (Brudney and Seldon, 1995). Norris (1999) reported that larger cities would adopt more sophisticated and advanced IT compared to smaller cities because larger cities: (a) have greater financial resources, (b) are in more need of these technologies and, (c) have superior institutional ability such as IT departments, to support the technologies. Conversely, Mohr (1969) reported that larger organisations, simply because they are large, are unlikely to adopt IT. Recognising that size and adoption are often associated, Mohr (1969) stated that size itself is not related to innovativeness by logical necessity; it becomes significant only when it implies or indicates the conceptual variables that are important in them. Size may indeed have indirect effects. However, it is also likely to lead directly to economies of scale that enhance the feasibility of IT adoption. Literature indicates that larger organisations input sufficient volume to justify the adoption of new technology to accommodate variations in input even when variations occur infrequently. Smaller organisations, however, experience many types of input variations so rarely that they could not reasonably expect to benefit from making similar accommodations (Moch and Morse, 1977). While Mohr (1969) is likely to be correct in reporting that size has indirect effects on adoption, it is likely that, conceived as input volume, size has a direct effect as well. The researcher asserts that as size intensifies, organisations tend to adopt more sophisticated technologies to enhance their IT infrastructure. Thus, size may influence EAI adoption in the local government authorities.

- **Top Management Support:** Top management support has been recognised as one of the most important elements necessary for the successful implementation of integration technologies and integrated packages (Ngai and Gunasekaran, 2004; Colmenares, 2004; Premkumar *et al.,* 1994). Beath, (1991) also reports that one of the most successful factors associated with large-scale IT implementation projects is securing the support of top management. In addition, sustained top management support in the local government as the most relevant factor in IT implementation projects, is needed throughout the implementation project (Kamal and Themistocleous, 2006; 2007; Chen and Gant, 2001). The reason is as the project progresses, active involvement of top management remains critical in constantly monitoring the progress of the project and providing direction to the implementation teams (Pardo and Scholl, 2002; Bingi *et al.,* 1999). Moreover, as top management's primary responsibility is to provide adequate financial support and resources for building a successful system, the support of management ensures that the implementation project has a high priority within an organisation and that it receives the required resources and attention (Kamal and Themistocleous, 2006; 2007). Therefore, all above facts provide sufficient justification to consider top management support as an influential factor for EAI adoption in the local government authorities.

3.1.3 Proposed Factors for EAI Adoption in LGAs

In this section, the researcher proposes factors that may influence EAI adoption in the local government authorities. The reasons for proposing these factors are listed below:

- The emergence of EAI in LGAs (as explained in Sections 1.1, 1.2, and 2.4).
- The limitations of the normative literature indicate that there is an absence of theoretical models for EAI adoption in LGAs (detailed analysis specified in Sections 2.4 and 2.5).
- The complexity and limitations of existing LGA IT infrastructures causes several problems (as explained in Sections 1.1 and 2.2). EAI is a promising solution that helps organisations to bridge their applications together. To speed up the adoption of EAI in LGAs, the influential factors may assist the LGA decision makers in understanding EAI.

Irani *et al.,* (1999) report that there are difficulties faced by the managers in decision-making process during the technology adoption process and realisation of its maximum benefits as a problem. LGA top management is confronted with similar problems (Johnson and King, 2005). Collinge (2003) reports in this context that LGAs are in a difficult position. The reason is that the central government is demanding to see a return on investment from LGAs, whereas, citizens are demanding to see improvements in service delivery. LGAs have been required to submit planning statements, which set out how they are approaching the task of implementing e-enabled service delivery (ODPM, 2004). Anecdotal evidence from the LGA breakout session of the Government UK IT Summit (2005) indicated a general recognition that, despite some great successes, many other e-enabled areas lacked service-depth. With such LGA state along with less literature support on EAI adoption in the local government authorities, LGA decisions makers seek answers for its adoption. For this reason, the researcher analysed the factors identified from the literature in Sections 3.1, 3.1.1 and several other factors from government area discussed in Section 3.1.2.

However, the explanation of factors as aforesaid in Sections 3.1.1 and 3.1.2 indicates that several factors can be considered as main factors and sub factors e.g. ROI and cost can be considered as sub factors of financial capability. As financial capability refers to LGAs capital available for technology adoption, it can be deduced that if LGAs may have sufficient capital for bearing the cost of a technology (e.g. EAI) and adopting it, LGAs may invest in that technology and in addition, may also gain return on their investment. This illustrates that ROI and cost can be merged with financial capability and thus categorised as financial factors. Likewise, IT infrastructure and IT sophistication can be considered as sub factors to IT capability. Literature indicates that IT capability refers to the level of: (a) IT infrastructure, (b) personnel IT knowledge, and (c) IT sophistication of an organisation (Akbulut, 2002). As a result, IT infrastructure and IT sophistication can be merged with IT capability and categorised as technological factors.

Similarly, factors such as market knowledge, citizen's satisfaction, critical mass, and project champion can be considered as sub factors to external and internal pressures respectively. The reason is that market knowledge, citizen's satisfaction and critical mass factors relate to external environment. For example, LGA's knowledge on the availability of different technologies in the market etc, citizen's satisfaction on the services provided by LGAs and influence of other government organisations on a particular LGA for technology adoption as critical mass. Conversely, project champion as a sub factor for internal pressures i.e. project champion is a person who is committed to introduce technology initiative to the organisation and actively and vigorously promoting his/her personal vision for using technology, pushing the project over or around approval and implementation hurdles. This indicates pressure from internal personnel thus, categorising both internal and external pressures collectively as pressure factors. The categorisation of all the factors is illustrated in Table 3.1.

Factor Categories	**Factors**	**Literature Findings**		**Reused**	**Adapted**	**Considered as New Factors**
		EAI	**Government**			
Pressure Factors	Project Champion	–	✓	–	✓	✓
	Citizen's Satisfaction	–	✓	–	✓	✓
	Critical Mass	–	✓	–	✓	✓
	Market Knowledge	–	✓	–	✓	✓
Technological Factors	Evaluation Frameworks	✓	–	✓	–	–
	Technological Risks	✓	✓	–	✓	✓
	IT Infrastructure	✓	✓	✓	–	–
	Personnel IT Knowledge	–	✓	–	✓	✓
	IT Sophistication	✓	✓	✓	–	–
	Data Security and Privacy	–	✓	–	✓	✓
Support Factors	Top Management Support	✓	✓	–	✓	✓
	IT Support	✓	–	✓	–	–
	Higher Administrative Authority	–	✓	–	✓	✓
Financial Factors	Return on Investment	✓	✓	–	✓	✓
	Cost	✓	–	✓		
Organisational Factors	Centralisation	–	✓	–	✓	✓
	Managerial Capability	–	✓	–	✓	✓
	Barriers	✓	–	✓	–	–
	Benefits	✓	–	✓	–	–
	Formalisation	–	✓	–	✓	✓
	Size	–	✓	–	✓	✓

Table 3.1: Categorisation of Factors

Figure 3.2 illustrates the proposed factors influencing EAI adoption in LGAs and categorises the factors as identified in Sections 3.1.1, 3.1.2 and Table 3.1 into: (a) pressure, (b) technological, (c) support, (d) financial, and (e) organisational factors.

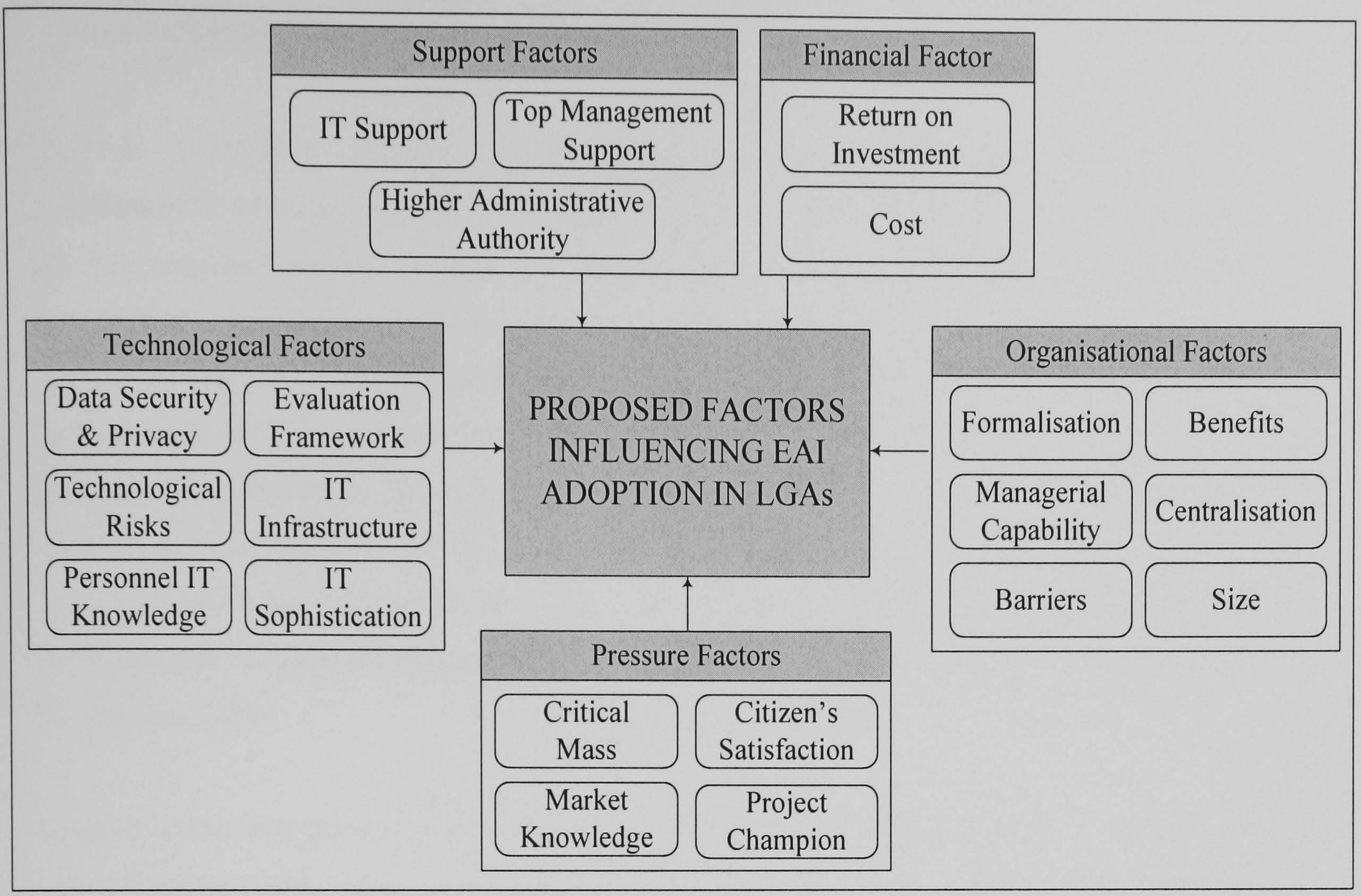

Figure 3.2: Proposed Factors for EAI Adoption in LGAs

The proposed factors (Figure 3.2) make novel contribution at conceptual level. These factors are a combination of common factors identified from the previous studies on EAI adoption reported in Section 3.1.1, with other specific factors from government area reported in Section 3.1.2. The researcher extends these works and adapts them to EAI in the area of the local government authorities, thus, resulting in the development of five categories of factors with sub factors influencing EAI adoption in LGAs. Nevertheless, these factors have yet to be evaluated in the practical arena. Hence, the researcher suggests that while adopting EAI, realising the factor(s) that influences the decision making process for EAI adoption in LGAs may provide a deeper understanding on EAI adoption process. Thus, the proposed factors might be considered when EAI is introduced in LGAs. In doing so, the proposed factors might: (a) extend the current research in EAI adoption, (b) enhance the level of EAI adoption analysis and (c) support LGA decision makers to adopt EAI. Therefore, the researcher proposes the following research issue for further investigation:

> ***Research Issue 1 – Proposed EAI Adoption Factors:*** *The proposed factors (Figure 3.2) can influence the decision making process for EAI adoption in the local government authorities.*

3.2 Investigating the Adoption Lifecycle Phases

Paul *et al.,* (2000) suggests that technology adoption can be comprehended as an organisation's decision to acquire a specific technology and make it available to target users for their task performance. Technology adoption lifecycle involves a sequence of distinct and consecutive phases an organisation passes through before taking the decision to adopt a technology (Frambach and Schillewaert, 2002; Gallivan, 2001). In this regard, Rogers (1995) explains that adoption process 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 other researchers proposed different adoption processes in the normative literature (Kamal, 2006; Frambach and Schillewaert, 2002; Gallivan, 2001; Darmawan, 2001).

With regards to organisational adoption, Gopalakrishnan and Damanpour (1997) reported two main distinguishable stages: the initiation and the implementation of the innovation. The adoption decision occurs between the initiation and implementation phases (Gopalakrishnan and Damanpour, 1997). In the initiation stage, the organisation becomes aware of the technology, forms an attitude towards it acceptance and further evaluates the new technology (Gopalakrishnan and Damanpour, 1994). 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 in the adoption process, the acceptance within the organisation becomes important. Gopalakrishnan and Damanpour (1997) and Rogers (1995) mentioned that the technology adoption process can only be considered as 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 analysis of these research studies illustrate the importance of adoption processes while adopting technology(s), however, these adoption studies also discuss on phases beyond the adoption phase. It can be said that these studies focused on both post-adoption phases and pre-adoption phases while adopting technology(s). However, it is not the intent of the researcher 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 other phases ahead of implementation. For example, EAI implementation in itself may encompass other sub phases such as scenario building and evaluation, business process reengineering, systems restructuring, requirement analysis etc (Themistocleous and Irani, 2006). Thus, the researcher focuses on the post-adoption phase for EAI adoption. This section moves the research a step forward by improving the decision-making process in LGAs while adopting EAI. This is by identifying different adoption lifecycle phases and mapping the factors (from Figure 3.2) on the phases identified. After analysing the literature on private and government area (Kamal, 2006; Frambach and Schillewaert 2002; Becker and Whisler, 1967), the researcher proposes that four phases are important while adopting technologies such as: (a) motivation, (b) conception, (c) proposal, and (d) adoption decision and explained as below.

- **Motivation** signifies the state when an organisation becomes aware of a technology and attempts to acquire knowledge about the technology. This 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) report this state as initiation phase in their respective models. Rogers (1983) reports in his innovation-decision process 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, 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.

- **Conception** refers to a plan of action that the organisation should pursue. In highly innovative organisations presumably this phase is exhibited by several organisational members such as creating an attitude towards technology adoption (Kamal, 2006; Becker and Whisler, 1967). Agarwal and Prasad (1998) and Davis (1989) refer this stage as *perception*, towards technology adoption. Rogers (1983) refers to this stage as persuasion. Persuasion occurs when an individual (or a decision-making unit) forms a favorable or unfavorable attitude towards innovation adoption (Rogers, 1983). It appears that conception phase is directly related to the motivation phase. For instance when an LGA is motivated to invest in EAI, decision makers may attempt to acquire the details i.e. to develop some views as to how EAI may assist them in solving their problems.

- **Proposal** refers to the making a formal proposition for technology adoption to rest of the organisation (Kamal, 2006; Becker and Whisler, 1967). 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. Literature indicates that analysing the fit of technology is an influential factor for technology adoption (Dixon, 1999). In several organisations, a formal justification proposal is prepared and accepted by decision-makers, prior to any investment or expenditures (Irani *et al.*, 2002). 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, 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).

- **Adoption Decision** is the actual phase where organisations take the decision to adopt a specific technology (Kamal, 2006; Rogers, 1983). Frambach and Schillewaert, (2002) and 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 aforementioned phases are exhibited as the adoption lifecycle phases in Figure 3.3.

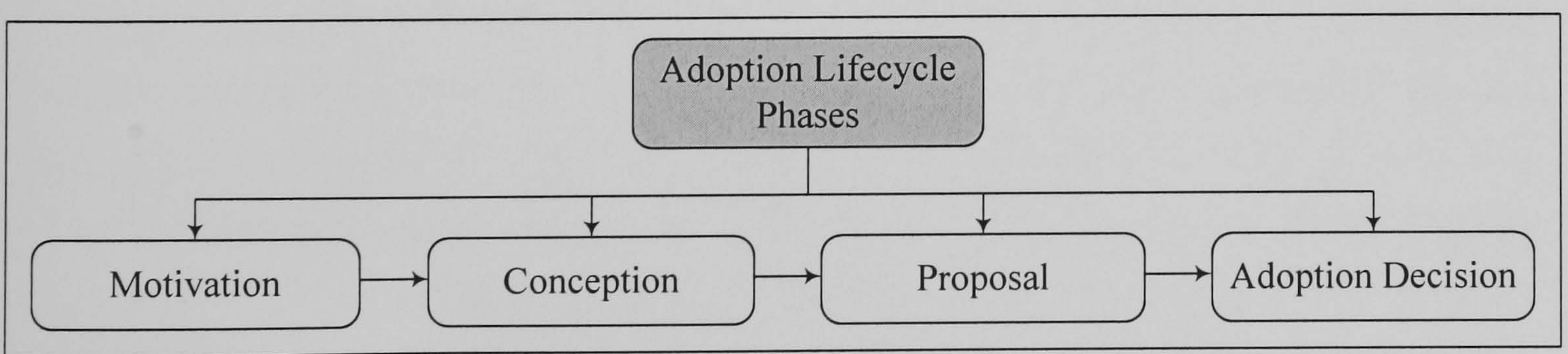

Figure 3.3: Proposed Adoption Lifecycle Phases

The proposed adoption lifecycle phases have yet to be evaluated in the practical arena. However, these adoption phases might be considered while adopting EAI to: (a) extend the current research in EAI adoption i.e. factors and adoption lifecycle phases, (b) enhance the level of EAI adoption analysis i.e. mapping of factors on adoption lifecycle phases and (c) support LGA decision makers to adopt EAI. Therefore, the researcher proposes the following research issue for further investigation:

Research Issue 2 – Adoption Lifecycle Phases: *The local government authorities can pass through several adoption lifecycle phases while adopting EAI.*

Table 3.2 highlights the literature findings on the adoption lifecycle phases. The researcher analysed the literature on private and government area (Kamal, 2006; Darmawan, 2001; Frambach and Schillewaert 2002; Becker and Whisler, 1967) and proposed these adoption lifecycle phases.

Adoption Lifecycle Phases	Literature Findings		Reused	Adapted	Considered as New Phase
	Private	Government			
Motivation	–	✓	–	✓	✓
Conception	✓	✓	–	✓	✓
Proposal	✓	✓	–	✓	✓
Adoption Decision	✓	✓	–	✓	✓

Table 3.2: Literature Findings on the Adoption Lifecycle Phases

3.2.1 Mapping EAI Adoption Factors on the Adoption Lifecycle Phases

The research conducted hitherto indicates that the process of EAI adoption and use in different sectors such as multinational, healthcare and SMEs has been significant to deriving the benefits of enterprise application integration (Mantzana, 2006; Khoumbati, 2005; Chen, 2005; Themistocleous, 2004). 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 has investigated the mapping of the factors influencing EAI adoption process on different phases of the adoption lifecycle (Figure 3.3). The researcher considers this as a literature gap and reports that it is important to understand and manage the EAI adoption process 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 (Themistocleous *et al.,* 2004; McIvor *et al.,* 2002).

With such aforesaid evidences, the researcher points out that it does worth to study the mapping of factors influencing EAI adoption in LGAs on different adoption lifecycle phases.

Along with the proposed factors influencing EAI adoption in LGAs (Figure 3.2), the mapping of factors influencing EAI adoption in LGAs on different phases of the adoption lifecycle also make a novel contribution at conceptual level. Nevertheless, the actual mapping of factors on different phases of adoption lifecycle will be carried out after conducting empirical research. Hence, the researcher suggests that while adopting EAI, realising the factor(s) that influences the decision making process for EAI adoption in LGAs on different phases of the adoption lifecycle may provide much deeper comprehension on EAI adoption process. Therefore, the researcher proposes the following research issue for further investigation:

> ***Research Issue 3 - 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.*

An example of the aforesaid research issue is given in Figure 3.4, where one or more influential factors of those proposed in Figure 3.2 are mapped on different phases of the adoption lifecycle. This example depicts that different factors may influence the decision making process for EAI adoption on different phases of the adoption lifecycle.

Motivation Phase	Conception Phase	Proposal Phase	Adoption Decision Phase
Factors	Factors	Factors	Factors
F1	F1	F1	F1
F4	F3	F5	F2
F6	F6	F4	F6
F9	F10	F7	F7
F11	F11	F9	F10
F15	F16	F19	F19
...	...	...	...
FX	FX	FY	FZ

Figure 3.4: Example on Mapping of EAI Adoption Factors on the Adoption Lifecycle Phases

3.3 Investigating the Prioritisation of Factors

This section focuses on the theory development on investigating the prioritisation of factors influencing EAI adoption in the local government authorities. Literature indicates several perceptions on the prioritisation of factors; however, a common explanation can be considered as the process of ranking all the factors in terms of their relative need or importance and therefore, assisting in the decision making process in an organisation (Lam and Chin, 2005; Salmeron and Herrero, 2005; Huang *et al.,* 2004). In the context of decision making in the local government authorities, several IT projects involve distributed decision-making based on a division of control and powers, as opposed to private organisation that have direct and undivided power over decisions within their span of control (Janssen and Cresswell, 2005; Ward and Mitchell, 2004). LGA structures, business processes and functions are often difficult to change as hierarchical bureaucratic structures often reflect a commitment to outmoded cultural values emphasizing risk aversion and valuing control of functional silos (McIvor *et al.*, 2002; Ongaro, 2004; Bichard, 2000).

Due to such structures and nature, LGAs faced failures in several major IT projects and the loss of IT investments resulting from inadequacies in making the business case (McIvor *et al.*, 2002). Lam (2005) also conclude that IT projects are poorly coordinated and LGAs act too independently. For reasons as aforesaid, IT project actions and results need to be better communicated among LGAs (Janssen and Cresswell, 2005). However, from a technical perspective, EAI projects have many significant differences comparing to other IT projects (Lam, 2005). The rationale for using EAI is not to build a system from scratch but to piece together multiple incompatible and in many cases heterogeneous applications (Themistocleous and Irani, 2006; Lam, 2005). Thus, the emphasis is on the integration of existing systems and not on the development of new systems. According to Ruh *et al.*, (2000) EAI projects bring a chain of organisational changes in terms of structure, control (e.g. process control) and workflow. These changes are deeper comparing to the other IT projects as they impact multiple systems, departments and employees and organisations itself (Ruh *et al.*, 2000).

EAI is increasingly recognised as an emerging solution to architecture design integrating previously separated and isolated systems to give them greater leverage and improve their performance (Lam, 2005; Janssen and Cresswell, 2005). However, with several researchers proposing EAI adoption factors in the private and public domain (Table 2.2), it may appear impractical for LGAs to devote their efforts to concurrently address and comprehend these factors. Partly, this can also be attributed to the lack of in-depth understanding and knowledge on EAI in LGAs (Themistocleous *et al.*, 2005; Janssen and Creswell, 2005). Moreover, various research studies also indicate that EAI is not a risk-free project (Lee *et al.*, 2003; Linthicum, 1999). In fact, different researchers consider that EAI is very often seen as high-risk projects (Themistocleous and Irani, 2002). This may be attributed to the development of a global integrated IT infrastructure that is considered of high risk for the following reasons: (a) there is no single application integration technology or software package that supports the development of a global integrated IT architecture and (b) there is a need to reengineer business processes to take advantage of EAI technology (Themistocleous and Irani, 2002).

Literature suggests that this may require considering the prioritisation of factors and identifying which factor(s) is more important (Huang *et al.,* 2004; Lee and Kim, 2000; Hutton and Zairi, 1995). Lam and Chin, (2005) support that determining the importance of factors enables organisations to develop priorities and in turn, improve their decision making process. Salmeron and Herrero (2005) and Saaty (1990) mention that organisations may need to consider the judgements of several individuals (e.g. interviewees in an organisational setting) while performing the prioritisation of factors. However, because of their diverse roles and responsibilities, backgrounds and objectives, etc., individuals may present different judgements on the prioritisation of the factors (Lam and Chin, 2005; Huang *et al.,* 2004; Badri *et al.,* 2001). The diverse judgements may be accommodated and synthesized by using certain methods that have been applied to IT adoption and discussed in the normative literature e.g. scoring, ranking, importance, mathematical optimisation and multi-criteria (Wei *et al.,* 2005; Salmeron and Herrero, 2005; Lee and Kim, 2000). Nevertheless, identification of a suitable method is discussed in Chapter 4 with empirical evaluation presented in Chapter 5.

3.3.1 Prioritising the Importance of EAI Adoption Factors on the Adoption Lifecycle Phases

The research conducted so far in the previous section indicates that the study of the prioritisation of factors, to a great extent, may determine whether the adoption will be successful in an organisation (Salmeron and Herrero, 2005; Lam and Chin, 2005; Huang *et al.,* 2004). The existing studies on EAI adoption have studied on factors demonstrating the causal inter-relationships between the EAI adoption factors (Khoumbati and Themistocleous, 2007; Khoumbati, 2005), actors and factors with the causal relationship among and between them (Mantzana, 2006; Mantzana and Themistocleous, 2005), research studies on the business perspectives e.g. EAI resulting in overall integration cost and achieving significant ROI (Themistocleous and Irani, 2006; Lam, 2005) and technical capabilities of EAI in integrating IT infrastructures (Lam, 2005; Janssen and Cresswell, 2005). From a conceptual and empirical point of view, none of the existing studies related to EAI has investigated on prioritising the importance of factors influencing EAI adoption on the adoption lifecycle phases.

The researcher considers this as a literature gap and reports that it is important to understand and manage the EAI adoption process in LGAs, as EAI is not a risk-free project, confusion regarding its scope, nature and level of applicability (Lee *et al.,* 2003; Linthicum, 2000; 1999). With such aforesaid evidences, the researcher suggests that it is important to study the prioritisation of factors influencing EAI adoption on adoption lifecycle phases. Hence, the aforesaid conceptions on prioritisation of factors may: (a) extend the current research on EAI adoption factors, (b) enhance the level of EAI adoption analysis i.e. prioritising the importance of EAI adoption factors (in conjunction) on adoption lifecycle phases and (c) support the decision making process in LGAs to adopt enterprise application integration. Thus, the researcher proposes the following research issue for further investigation:

> ***Research Issue 4 - Prioritising EAI Adoption Factors:*** *Prioritising the factors based on their importance at each phase of the adoption lifecycle can influence EAI adoption in LGAs.*

An example of the aforesaid research issue is given in Figure 3.5, where one or more influential factors of those proposed in Figure 3.2 are prioritised on different phases of the adoption lifecycle based on their importance. This example depicts the prioritisation of different factors influencing EAI adoption on different phases of the adoption lifecycle.

Motivation Phase	Conception Phase	Proposal Phase	Adoption Decision Phase
Ranking of Factors	Ranking of Factors	Ranking of Factors	Ranking of Factors
1. F2	1. F3	1. F2	1. F2
2. F3	2. F2	2. F4	2. F3
3. F4	3. F7	3. F5	3. F5
4. F5	4. F9	4. F10	4. F11
5. F12	5. F14	5. F11	5. F13
6. F17	6. F19	6. F12	6. F18
...	...	...	...
X. FX	X. FX	Y. FY	Z. FZ

Figure 3.5: Example on Prioritising the Importance of EAI Adoption Factors on the Adoption Lifecycle Phases

3.4 Factors, Phases, Mapping and Prioritisation Involved in EAI Adoption

The literature reported in the previous sections illustrates that the role of factors, adoption lifecycle phases, mapping of factors on adoption lifecycle phases and prioritising the importance of EAI adoption factors, can be considered to be of high importance during EAI adoption process in LGAs. As a result, the researcher proposes that when exploring EAI adoption in LGAs: (a) the identification of factors, (b) the identification of adoption lifecycle phases, and (c) the mapping and prioritising the importance of factors on different phases of the adoption lifecycle may provide a deeper understanding of such interrelationships within LGAs. Figure 3.6 illustrates an abstract model for EAI adoption in LGAs while RI – 1, RI – 2, RI – 3 and RI – 4 representing the Research Issues discussed in the earlier sections.

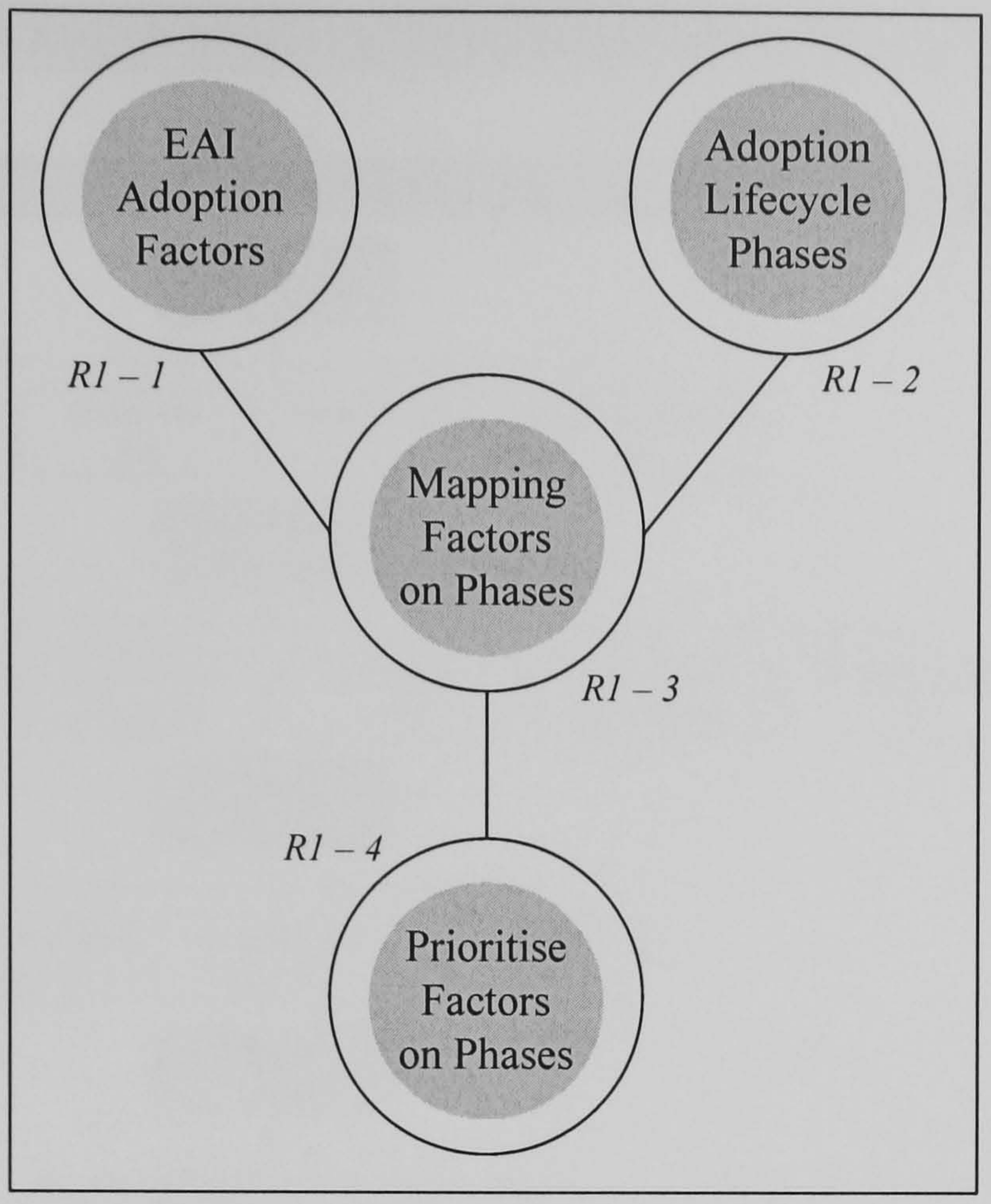

Figure 3.6: Abstract Model for EAI Adoption in LGAs

The abovementioned abstract EAI adoption model may assist in: (a) overcoming the limitations of the current research in EAI adoption, (b) improving the level of analysis for EAI adoption and (c) supporting LGA decision makers while adopting EAI. To this end, the researcher proposes that to study the EAI adoption in LGAs, the four approaches (factors, adoption lifecycle phases, mapping of factors on adoption lifecycle phases and prioritising the importance of EAI adoption factors on adoption lifecycle phases) should be integrated. In doing so, a more detailed model for enterprise application integration adoption in the local government authorities is proposed and illustrated in Figure 3.7.

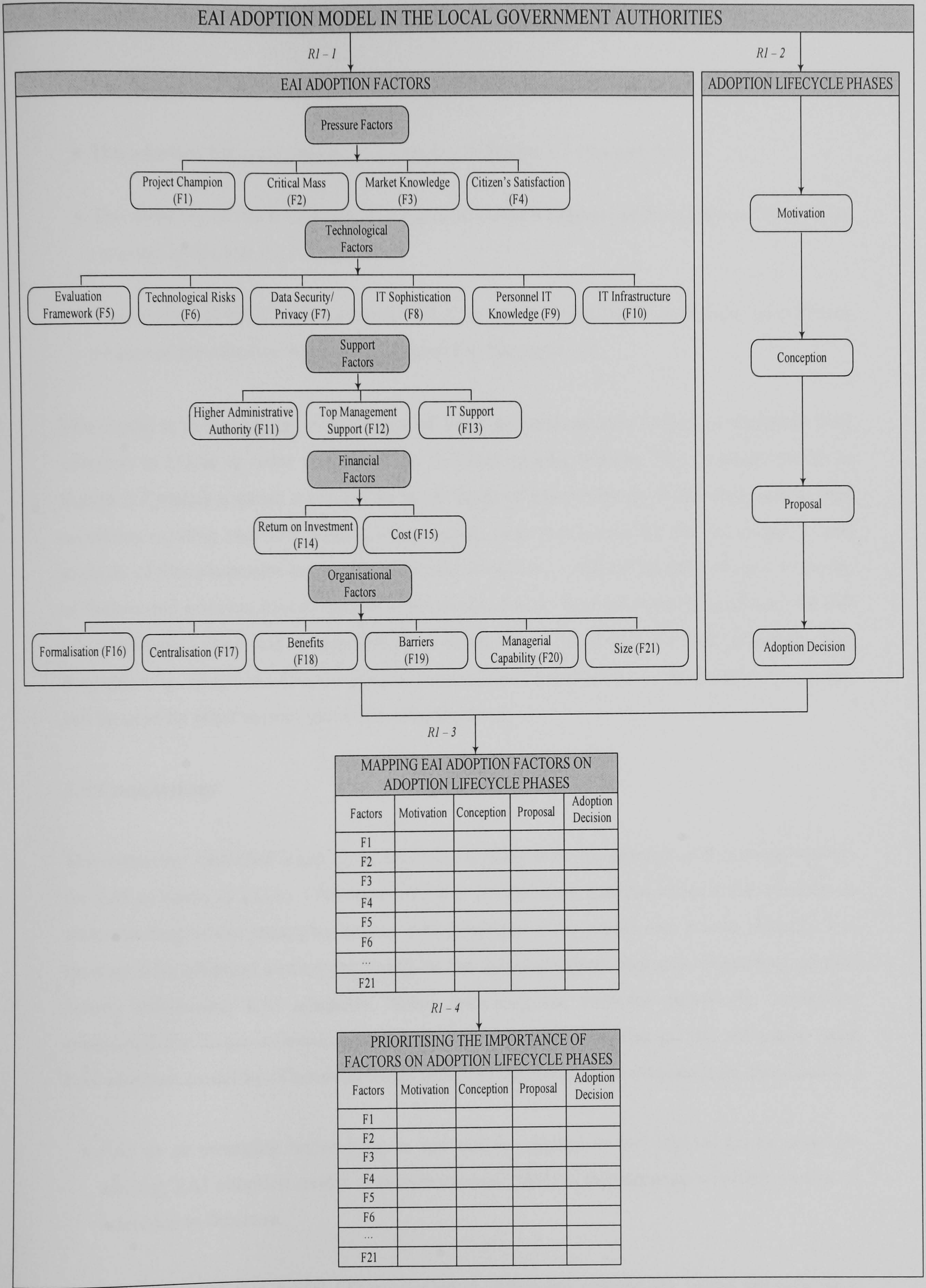

Figure 3.7: Proposed Conceptual Model for EAI Adoption in LGAs

The proposed model (Figure 3.7) consists of:

- The factors that may influence EAI adoption, as presented in Figure 3.2.
- The adoption lifecycle phases, as presented in Figure 3.3 (Section 3.2).
- The mapping of the EAI adoption factors on different phases of the adoption lifecycle as reported in Section 3.2.1.
- The ranking of the EAI adoption factors based on their priority (importance) on different phases of the adoption lifecycle as reported in Section 3.3.1.

This model is in accordance with the aim of this thesis that seeks to propose a model for EAI adoption in LGAs in order to support the decision making process. The proposed model in Figure 3.7 makes a novel contribution to the body of knowledge as it: (a) incorporates and combines existing and new factors, (b) proposes new dimensions for the investigation and analysis of this phenomenon e.g. classification of factors, adoption lifecycle phases, mapping of factors and prioritisation of factors, (c) provides a more detailed instrument of analysis and (d) facilitates LGAs and researchers in making robust decisions for EAI adoption. The concepts (e.g. adoption lifecycle phases, mapping and prioritising the factors) of this model can be used by other sectors too while adopting EAI.

3.5 Conclusions

The researcher identified a gap in the literature dealing with the absence of theoretical models for EAI adoption in LGAs. Literature indicates several EAI adoption models that provide an understanding of the principles behind EAI adoption in the public and private domain. The existing EAI adoption studies are based on the factor-oriented approach illustrating several factors influencing EAI adoption. Thus, following the research trends the researcher considered the factor-oriented approach for this research. In doing so, the researcher used EAI adoption model by (Themistocleous, 2004) as the basis for this research for the reasons:

- EAI as an emerging technology, is not widely studied in the area of LGAs, thus the existing EAI adoption model (Themistocleous, 2004) is the foremost available source of reference in this area.
- The factors of this model (Themistocleous, 2004) are empirically tested through more than 30 case studies in private as well as in public sector organisations (e.g. healthcare).

- Several researchers in the areas of e.g. healthcare, SMEs and large organisations have incorporated some factors from the model proposed by Themistocleous (2004). Thus, these factors may also assist the researcher in analysing EAI adoption in LGAs.

Using the concepts of this model the researcher further expanded the scope of the research by exploring the government area. In doing so, several other factors were identified like: (a) formalisation, (b) centralisation, (c) managerial capabilities, (d) project championship, (e) IT capabilities [IT infrastructure, Personnel IT Knowledge and IT Sophistication], (f) technological risks, (g) data privacy and security, (h) higher administrative authority, (i) financial capability [ROI and cost], (j) critical mass, (k) market knowledge, (l) citizen satisfaction, (m) size, and (n) top management support. The researcher proposed the factors influencing EAI adoption in LGAs in Section 3.1.3 by combining the factors identified in Sections 3.1.1 and 3.1.2. These factors make a novel contribution at the conceptual level for EAI adoption in LGAs.

The researcher attempted to further extend this research by presenting different adoption lifecycle phases in Section 3.2. The adoption lifecycle phases were identified by analysing different IT adoption models. Furthermore, to enhance the decision-making process in LGAs, the researcher discussed on several theorised conceptions on the prioritisation of factors from the literature in Section 3.3 and 3.3.1. This may provide insights into the direction of better understanding the importance of factors influencing EAI adoption in LGAs. In piecing together the factors, adoption phases, mapping and prioritisation technique, a conceptual model to study EAI adoption in LGAs is proposed in Section 3.4. This model combines the proposed influential factors for EAI adoption (Figure 3.2) with the adoption phases (Figure 3.3). To test this model in the practical arena, the researcher proposed four research issues summarised in Table 3.3.

Proposed Research Issues for Further Investigation	
Research Issue	**Description**
EAI Adoption Factors	• Proposed factors (Figure 3.2) can influence the decision making process for EAI adoption in the local government authorities.
Adoption Lifecycle Phases	• The local government authorities can pass through several adoption phases (Figure 3.3) while adopting EAI.
Mapping EAI Adoption Factors	• The influential factors for EAI adoption can be mapped (Figure 3.4) on different adoption lifecycle phases to support the decision makers while adopting EAI.
Prioritising EAI Adoption Factors	• Prioritising factors (Figure 3.5) based on their importance at each phase of the adoption lifecycle can influence EAI adoption in LGAs.

Table 3.3: Proposed Research Issues for Further Investigation

In Chapter 4, the researcher presents the research methodology used to test the proposed EAI adoption model and research issues proposed for further investigation.

4

Chapter 4: Research Methodology - A Qualitative Case Study Approach

Summary

In Chapter 3, the conceptual model for enterprise application integration adoption in the local government authorities was proposed and described. In this chapter, the researcher describes how the current thesis 'research issues' will be resolved and the aim and objectives will be achieved. In doing so, this chapter describes the research methodology of the work presented in this thesis. This description is within the context of research methods frequently used in the area of information systems. Initially, Sections 4.1, 4.1.1 and 4.1.2 review on (a) positivism, (b) critical theory, (c) post-positivism and (d) interpretivism epistemological stances and results in the justification of interpretivism as the research approach that is adopted by this thesis. Thereafter, in Section 4.2, the researcher explains why qualitative research is used in this research and further explains the benefits and limitations of qualitative research. In Section 4.3, the researcher selects and explains an appropriate research strategy i.e. justifies the adoption of a case study research strategy in Section 4.3.1 and differentiates between single and multiple case studies in Section 4.3.1.1. Then in Section 4.4, an empirical research methodology is presented. This acts as a framework for conducting the empirical enquiry. Literature indicates bias as a risk while using the qualitative research approach. However, the bias is overcome in this research through data triangulation as exemplified in Section 4.5. Finally in Section 4.6, this methodology is transformed into a protocol, which acts as a data collection tool where data are deduced from case organisation LGAs, such that the proposed research issues can be resolved and the conceptual model validated. To conclude the chapter, Section 4.7 summarises the conclusions.

4.1 Selecting an Appropriate Research Approach

Since IS is multi-disciplinary with many of its aspects related to specialised subjects, the identification of an appropriate research approach is not a simple task (Land, 1992). In addition, there is no single framework that includes all the domains of knowledge needed for the study of IS (Galliers, 1992). Walsham (1995a) states that selecting an appropriate research approach is a major task of the research design process. The reason is that there is plethora of methodologies that can be selected from, or what Galliers (1994) called, the methodological pluralism. Orlikowski and Baroudi (1991) report that IS are not rooted in a single theoretical perspective, but there is a wide range of philosophical assumptions regarding the underlying nature of phenomena under investigation. Thus, there is a range of research approaches available to IS researchers, not simply the more traditional ones with each research approach having its own strengths and weaknesses (Galliers, 1985).

4.1.1 Underlying Philosophical Assumptions

It is essential to comprehend the philosophical assumptions underpinning the appropriate approach selected. This is because it facilitates the development of a strong case to select a research approach (e.g. qualitative or quantitative) for a particular study (e.g. investigating EAI adoption in the local government authorities). Several philosophical research approaches are available for IS research. Guba and Lincoln (1994) suggested four underlying 'paradigms' for qualitative research: (a) positivism (or scientific); (b) critical theory; (c) post-positivism and, (d) constructivism (or interpretivism). These approaches rely on different assumptions about the nature of knowledge, and demand different approaches to research, with Irani *et al.*, (1999) having discussed their respective characteristics. Myers (1997) also reports that while these research epistemologies are philosophically discrete, in the practice of social research these distinctions are not always so specific.

There is considerable disagreement as to whether these research paradigms or underlying epistemologies are necessarily opposed, and there is further debate about whether they can be accommodated within one study (Myers, 1997). Evidences from literature report that among all, positivism has been the dominant epistemology in IS research (Miles and Huberman, 1994; Yin, 1994). Orlikowski and Baroudi (1991) suggest that IS can be classified as positivist if there is evidence of formal propositions, quantifiable measures of variables, hypothesis testing, and drawing of inferences about a phenomenon from a perspective sample to a stated population. Galliers (1992) also reports that positivism assumes that observations of phenomena under investigation can be made objectively and rigorously (by measurement).

Nonetheless, positivism approach has arisen from scientific tradition and thus, is characterised by repeatability, reductionism and refutability.

IS research can be classified as *critical* if the main task is seen as being one of a social critique, whereby the restrictive and alienating conditions of the status quo are brought to light (Hirschheim and Klein, 1994). Critical researchers assume that social reality is historically constituted, and that it is produced and reproduced by people. Although people can consciously act to change their social and economic circumstance, critical researchers recognise that their ability to do so is constrained by various forms of social, cultural and political domination (Myers, 1997). It is also important to mention here the *post-positivist* approach that is positioned between positivism and critical theory in the literature, as it has been introduced as a need to change direction from positivism and to transcend its limitations (Lincoln and Guba, 2000). Post-positivism challenges the tradition that knowledge is actually apodictic, instead knowledge claims are simply those accepted by the community (Galliers, 1992). From a methodological stance, an interesting part of post-positivist thought is its belief in what might be termed "methodological pluralism" – the claim that there is no one correct method of science, but many methods (Galliers, 1992).

Literature indicates that positivism, critical and *post-positivist* are not the only relevant approaches to IS. An alternative to positivism, critical and *post-positivist* is interpretivism. Interpretivism assumes that the knowledge of reality is gained only through social constructions such as consciousness, shared meanings, language, documents, tools and other artifacts. The philosophical base on interpretive research is hermeneutics and phenomenology. Saunders *et al.,* (2000) and Ritchie and Lewis (2003) report that the phenomenological philosophy of the social world of business and management is too difficult to be theorised by definite laws similar to physical sciences, and would reveal the details of the situation to comprehend the reality, or perhaps a reality working behind them. Hermeneutics can be treated as both an underlying philosophy and a specific mode of analysis (Bleicher, 1980). As a philosophical approach to human understanding, it provides the philosophical grounding for interpretivism, whereas, as a mode of analysis, it suggests a way of understanding textual data. Interpretive studies are mainly conducted in an endeavour to understand phenomena through the meanings that people assign to them.

According to Kaplan and Maxwell (1994), interpretivism research does not predefine dependent and independent variables but focuses on the complexity of human sense as the situation emerges. Walsham (1993) further explains that interpretivism research aims at the "understanding of the context of the IS and the process whereby the IS influences and is influenced by the context". In interpretivism, researchers tend to allow factors (concepts) to emerge from field data, rather than entering the field with pre-conceived theories (Glaser and Strauss, 1967; Miles and Huberman, 1994). Walsham (1995a) explains more on this issue by reporting that whilst it is important to access existing theory in a particular subject domain, it is equally important not to assume that it represents final truth in that area.

4.1.2 Selecting Interpretive Research Approach

The diversity of research paradigms poses complex challenges for the selection of the appropriate approach for this research. The researcher argues that for the purpose of this thesis, the interpretive approach has been selected as an appropriate underlying research assumption for investigating EAI adoption in LGAs. The reasons for this choice are threefold.

- Acquiring background knowledge, literature review and analysis presented in Chapters 1, 2 and 3 indicates that there are several organisational, support, pressure, financial and technological factors related with EAI adoption in LGAs. These factors appear to be complex and interrelated. According to Wood-Harper and Wood (2005) there is continuing uncertainty over exactly how to study the complex, emerging interrelationship between technology and the social context within which it is both developed and used. Thus, the study of investigating EAI adoption in LGAs may not therefore be easily separated from its organisational, support, pressure, financial and technological context. In addition, EAI adoption factors as reported in Sections 3.1.1 and 3.1.2 need to be mapped on different adoption phases of the adoption lifecycle (Section 3.2) and prioritising the importance of EAI adoption factors within each phase (Section 3.3) for the purpose of enhancing the decision making process while adopting EAI in LGAs. Therefore, there is a need for a research approach that will allow the researcher to understand the process of EAI adoption as well as all the factors (Figure 3.2) that influence EAI adoption in LGAs. Moreover, assist the researcher in mapping and prioritising the importance of EAI adoption factors through empirical results.

- According to the analysis reported in Chapters 1 and 2, LGAs are different organisations compared to other sectors however, such LGA characteristics exemplify that the study of human actions and behaviour in LGAs is distinct from other sectors. In line with this, Moore and Read (2006) claim that researchers need to adopt an approach that allows them to get close to participants, penetrate their internal logic, and interpret their subjective understanding of reality. Especially when there are considerable differences between different sectors (Ward and Mitchell, 2004).

- As the social world cannot be reduced to isolated variables, such as space and mass, it must be observed in its totality. According to the literature, findings produced by positivist approaches are generalisable only to the extent that the conditions under which data are collected exist in the social world (Shaw, 1999). Therefore, the researcher asserts that to investigate EAI adoption in LGAs, there is a need for a research approach that may allow LGAs to be viewed in their entirety and permits researchers to get close to participants, penetrate their realities, and interpret their perceptions. Hence, the researcher considers interpretivism as more appropriate for the research reported in this thesis for the reasons explained thus far.

Having justified the use interpretive research approach in this section, Section 4.2 describes the nature of qualitative research approach in order to justify its relevance to this research.

4.2 Justifying the Use of Qualitative Research Method

Qualitative research can be described as a type of research that involves interpreting non-numerical data (Miles and Huberman, 1994). Van (1983) reports that qualitative method is an array of interpretive techniques which seek to describe, decode, translate and otherwise come to terms with the meaning, not the frequency of certain more or less naturally occurring phenomena in the social world. Denzin and Lincoln (1994) also propose that qualitative research is multi-method in focus, involving an interpretive, naturalistic approach to its subject matter. These definitions here imply that the qualitative researchers study things in their natural environment, and they comprehend events in terms of meanings.

Literature indicates that the term 'interpretive' research is frequently used interchangeably with 'qualitative' research (Galliers, 1992). Hakim (2000) also reports that qualitative research tends to be used most heavily in disciplines where the emphasis is on description and explanation (such as psychology, sociology and social anthropology), rather than on prediction (as in economics). However, some researchers such as Denzin and Lincoln (1994) support qualitative research as cross-cutting disciplines, fields and subject matter. There are a number of concepts, traditions and assumptions related to qualitative research. These include traditions such as positivism, post-positivism, and many perspectives and methods connected to cultural and interpretive studies.

Myers (1997) also supports that qualitative research may or may not be interpretive, depending upon the underlying philosophical assumptions of the research, and suggests that qualitative research can be positivist, interpretive, or critical. To gain a clear understanding of qualitative research, it is necessary to compare its basic purpose and focus to those of quantitative research. The differences as reported in Table 4.1 mainly result from the positivist perspective of quantitative research (the belief that the world can be measured, understood, and generalised about) versus the non-positivist perspective of qualitative research (the belief that the world cannot be generalised about).

Research Approach	References	Research Approach	References
Quantitative • Use of mathematical and statistical techniques to identify facts and causal relationships. Samples can be larger and representative. Results can be generalised to larger populations within known limits of error.	Kaplan, (1964); Lincoln and Guba, (2000).	**Qualitative** • Determining what things exist rather than how many there are. Thick description. Less structured and more respective to needs and nature of research situations.	Bogdan and Taylor, (1975); Nissen, (1985).
Positivist • Belief that the world conforms to fixed laws of causation. Complexity can be tackled by reductionism. Emphasis on objectivity, measurement and repeatability.	Hirschheim, (1985); Klein and Lyytinen, (1985).	**Interpretivist** • No universal truth. Understand and interpret from researcher's own frame of reference. Uncommitted neutrality. Realism of context important.	Bogdan and Taylor, (1975).
Confirmatory • Concerned with hypothesis testing and theory verification. Tends to follow positivist, quantitative modes of research.	Ives and Olson, (1984).	**Exploratory** • Concerned with discovering patterns in research data and to explain/understand them. Lays basic descriptive foundation. May lead to generation of hypothesis.	Trauth and O'Connor, (1991).
Deduction • Uses general results to ascribe properties to specific instances. Associated with theory verification and hypothesis testing	Popper, (1963); Mintzberg, (1979).	**Induction** • Specific instances used to arrive at overall generalisations. Criticised by many philosophers of science but plays an important role in theory/ hypothesis conception.	Popper, (1963); Hirschheim, (1985).
Laboratory • Precise measurement and control of variables, but as expense of naturalness of situation, since real-world intensity and variation may not be achievable.	McGrath, (1984).	**Field** • Emphasis on realism of context in natural situation, but precision in control of variables and behaviour measurement cannot be achieved.	McGrath, (1984); Van Horn, (1973).

Table 4.1: Differences in Qualitative and Quantitative Approach (Adapted: Missi, 2005)

The qualitative research approach is selected in this thesis since a main assumption of this approach is that qualitative researchers study things in their natural settings, attempting to understand phenomena in terms of the meanings that people bring to them (Denzin and Lincoln, 1994). The qualitative paradigm recommends that researchers observe human behaviour and action as it occurs in mundane everyday life (Schutz, 1967). The research presented in this thesis focuses on EAI adoption in the local government authorities. As reported in Section 4.1.2 that the study of human actions and behaviour in LGAs is distinct from other sectors, it is essentially concerned with the nature of reality in the social world. Therefore, the principle of scientific methods, e.g. quantitative methods applied to the study of people, is questioned, and hence a qualitative approach is suggested. Additionally, Marshall and Rossman (1999) reviewed several research studies that qualitative research method would be appropriate for. Examples of these types that also correspond to the requirements of the present study (EAI adoption in LGAs) are detailed below:

- Research for which related (a) factors, (b) adoption lifecycle phases, (c) mapping of factors and (d) prioritising the importance of factors have to be identified;
- Research that examines in-depth complexities and processes;
- Research on less acknowledged phenomenon i.e. EAI adoption in LGAs;
- Allows researcher considerable flexibility during interviews and observations;
- Research that cannot be carried out experimentally for the practical or ethical reasons;
- Research on informal and unstructured linkages and processes in organisations;
- Researcher can study EAI in a natural setting (the local government authorities) and generate theories from practice.

Remenyi and Williams (1996) suggest that when an area of science is involved with human and organisational idiosyncrasies, qualitative research methods should be used. Besides this, Irani (1998) supports this argument that events that form a phenomenon are conditioned by interacting variables, such as time and culture. This denotes that no two situations are identical. As a result, it appears that quantitative research methods are inappropriate in this case, as they are unable to take account of the differences between people and the objects of the natural sciences. IS research is concerned with human beings and therefore, any methodology that uses quantitative research methods must recognise the variability that is inherent in human behaviour. The research presented in this thesis, focuses on the factors influencing the decision-making of human beings (e.g. head of IT, project managers, systems developers etc) while adopting EAI in LGAs.

As a result, the principle of scientific methods to the study of people is questioned thus, suggesting the suitability of a more qualitative approach. It appears from the objectives of this thesis (Section 1.3), that the issues under investigation are confidential and subjective, with much context to the data needed. This suggests that the selected research methods must be able to take account these issues and acknowledge that many management decisions are idiosyncratic and guided by circumstances pertaining the organisation. Clearly, rich empirical data is required to provide more understanding regarding EAI adoption process in LGAs. The need for rich empirical data indicates that the use of qualitative research methods is appropriate, since they allow examining in depth processes.

In addition to the benefits of qualitative research approach, the limitation associated to qualitative research are also highly acknowledged in the IS literature. These limitations should be taken into account while adopting a research approach. For example, Miles and Huberman (1994) reported limitations associated with qualitative research approach. These limitations include the fact that qualitative data has certain, rather problematic characteristics, which set it apart from quantitative data. Qualitative data is usually predominantly textual, with a richness that can be lost when aggregation or summarisation occurs. The data can be fairly unstructured and unbounded as it concerns people's behaviour and attempting to understand their perception of a particular situation. It is often longitudinal, to a greater or lesser extent as the observations may continue for an extended period of time. Interviews may be repeated at intervals of a few days, weeks or months. Besides this, Lee (1991) also identified the disadvantages of qualitative analysis as a lack of controllability, deductibility, repeatability and generalisability.

Smithson and Cornford (1996) also found that there are more drawbacks to qualitative research. As the research uses a small number of cases, in some cases only one, it is difficult to generalise it to a wider range of situations. Furthermore, as the data attained is usually rich and complex, it indicates that it is open to a number of interpretations, such that researcher bias is a continuous danger. Researchers that are involved in dynamic cases where the situation is changing frequently, face inherent problems in trying to make controlled observations, deductions (e.g. using mathematical and statistical methods) and predictions. This causes problems to the validity and verifiability of the research. With these limitations and due to the epistemological stance being followed in this thesis, qualitative research was still selected to be most appropriate for this research for the following reasons:

- Qualitative research is beneficial mainly as qualitative data is collected in its natural setting (e.g. EAI adoption in LGAs), thus facilitating the effect of the environment to be taken into account, and it has richness and holism (Miles and Huberman, 1994; Denzin and Lincoln, 1998).

- Qualitative research is multi-method that involves an interpretive and naturalistic approach to its subject matter. This implies that qualitative researchers study matters in natural settings and they understand events (e.g. EAI adoption) in terms of meanings. Moreover, using qualitative research approach, the researcher is able to plan in questioning the participants, thus fostering more natural and realistic information making it a favourable approach for this research.

- As explained in Chapters 1, 2 and 3, there is limited research regarding EAI adoption in LGAs. Thus, qualitative research may support the researcher to study EAI in its natural setting, and learn from practice within LGAs. This may also allow the researcher to understand the nature and the complexity of the EAI adoption process within LGAs.

- The issue regarding generalisations is overcome by using Walsham's (1995b) comments in that interpretivist case studies offer four types of generalisations, thereby overcoming this particular issue. The bias considered as a risk while using the qualitative research approach is overcome in this research through data triangulation

Based on the research assumptions and approaches presented to this point, the adoption of qualitative research for this study seems a useful approach to the acquisition of a better understanding of the phenomena under investigation. In the next section, the qualitative research process i.e. selecting an appropriate research strategy is discussed.

4.3 Selecting an Appropriate Research Strategy

Research strategy is the means of conducting research, taking on a particular style and employing different research methods for data collection (Galliers, 1992). Therefore, to decide on a research strategy that would dictate the way in which data is collected and analysed, different research strategies need to be reviewed. Furthermore, their characteristics should be identified, and a research strategy be justified in light of these study characteristics. The most used strategies include; case study, survey, experiment, grounded theory, field study, action research, longitudinal studies, ethnography, exploratory, descriptive, and explanatory studies (Saunders *et al.*, 2000; Cavaye, 1996). Yin (1994) believes that in choosing and/or differentiating between research strategies, three criteria must be looked at carefully; (a) the type of the research question(s) posed, (b) the extent of control the researcher on actual behavioural events, and (c) the extent of focus on present events, in comparison to historical events. In the context of the present research, Section 4.3.1 justifies the appropriateness of case study based research strategy.

4.3.1 Justifying the Use of Case Study Research

Literature indicates case study research as an influential research strategy in the IS research community (Klein and Myers, 1999; Galliers, 1992; Orlikowski and Baroudi, 1991), particularly in the development of new theory and theory testing (Yin 1994; Benbasat *et al.*, 1987). In addition, case study research has also been a common research strategy in other disciplines such as psychology, sociology, political science, business, community planning and economics research (Ghauri and Grønhaug, 2002). Yin (1994) and Cavaye (1996) state that in all such disciplines, the distinctive need for case study research represents a way to systematise observation and aims for in-depth understanding of complex social phenomenon. The term 'case study research' is not a monolithic one, in fact this research strategy is versatile and open to a lots of variation, and can be carried out taking a: (a) positivism, interpretivism and or critical stance; (b) can take deductive or inductive approach; (c) can use qualitative or quantitative methods and, (d) can investigate single or multiple cases, depending upon the underlying philosophical assumptions of the researcher (Myers and Avison, 2002).

Yin (1994) suggests that a case study is an intensive examination of a phenomenon in its natural setting, employing multiple methods of data to gather information from one or more entities (e.g. people, groups). Data is collected via interviews, observation, and questionnaires and written materials. Cavaye, (1996) further explains that case study research can be highly structured, positivist, deductive investigation of multiple cases; it can also be an unstructured, interpretive, inductive investigation of one case study; lastly, it can be anything in between these two extremes in almost any combination. All such explanation signify that case study based research can be employed in a number of ways however; may lead to different research output.

Yin (1994) suggests that there are different case study types such as exploratory, descriptive and explanatory depending on whether they are used to answer *what, how*, and *why* research questions. Saunders *et al.,* (2000) describes exploratory studies as a valuable means of finding out what is happening; to search for new insights; to pose questions and to assess phenomenon. This is achieved through a literature search, interacting and discussing with experts in the subject, or conducting focus group interviews. Furthermore, explains that the aim of descriptive studies is to describe a precise profile of persons, events or situations, and is generally used as extension to explanatory research. Explanatory studies establish casual relationships between factors, and are employed in quantitative studies where data is subjected to statistical tests such as correlations (Saunders *et al.,* 2000).

Based on this taxonomy, the case study followed in this research can be classified as exploratory. The reason is that the research focuses more on questions of what type (e.g. what are the factors that influence the EAI adoption in LGAs). Exploratory case studies as presented in this research are useful for theory building as they are valuable in developing and refining concepts for further study. Roethlisberger (1977) reported that the case study research is specifically appropriate for a selection of problems e.g. those in which research and theory are at their early formative stages. As stated in Chapters 1, 2 and 3 that there is limited research on EAI adoption in the local government authorities, thus, qualitative case study strategy is considered as appropriate for investigating EAI adoption in LGAs.

4.3.1.1 Single and Multiple Case Study Research

Case studies can be single or multiple and the major decision to analyse one or multiple cases is a central one to case study design. Each case study can be holistic (e.g. single unit of analysis) or embedded (multiple unit of analysis). A single case study may enable the researcher to investigate a phenomenon in depth, getting close to the phenomenon, providing rich primary data and revealing its deep structure within the organisational context (Cavaye, 1996). In the context of this research, it may enable the research to develop a 'full picture' of the organisational idiosyncrasies and allow the researcher to investigate EAI adoption in LGAs. Nevertheless, a single case may not provide sufficient insight into the phenomenon of EAI adoption in LGAs. The reason is that most research efforts require multiple cases, but single cases are only useful in specific instances. According to Yin (1994) suggests single case study is appropriate if:

- It is a *revelatory* case, i.e., it is a situation previously inaccessible to scientific investigation.
- It represents a *critical case* for testing a well-formulated theory.
- It is an *extreme* or *unique* case.

Bonoma (1985) claims that single case study projects are most useful at the outset of theory generation and late in theory testing, which is not the case for this research. As Benbasat *et al.,* (1987) suggests a single case used for exploration may be followed by a multiple case study. Therefore, in the light of the characteristics of this research, a single case study may not be appropriate. Instead of a single case study approach, the researcher suggests that multiple cases might be more appropriate for the research proposed in this research. Conducting multiple cases may enable the researcher to examine and 'cross-check' findings. Also, the analysis of data across case organisations may be possible with this strategy (Cavaye, 1996). Multiple cases may provide the research with a more 'robust' investigation of cause and effect relation of the units of analysis (Herriot and Firestone, 1983), as it may be able to move the investigation from one organisational context to other. Thus, isolating idiosyncrasies that contribute to explaining the phenomenon, the number of case studies conducted may depend on how much is known about the phenomenon, and how much information that can be uncovered for conducting additional cases (Dyer *et al.*, 1991). In the context of this thesis, a multiple case study strategy has been adopted to study EAI projects in the local government authorities.

4.4 Empirical Research Methodology

According to Rudestam and Newton (1992), one way of thinking about the phases of the research process is with reference to the so-called research wheel. The wheel metaphor suggests that research is not linear but a recursive cycle of steps that are repeated over the period of time, for the purpose of validating the empirical stages with the theory from where the theoretical concepts stems out. Flick (1998) also suggests that the use of a set of procedures that are open-ended and rigorous at the same time are important of a qualitative research design. These procedures do justice to the complexity of the social setting under investigation. Jankowicz, (2000) developed an empirical research methodology, which is also based on three stages, namely: (a) research design, (b) data collection, and (c) data analysis. The analysis of the normative literature indicates that this research methodology phases are based on the following three stages of the qualitative research design: (a) warming-up and preparation, (b) stretching exercises, and (c) cooling-down (Janesick, 2000). Based on the research designs as aforesaid, the researcher has developed an empirical research methodology that acts as the blue print for the research process, to evaluate the proposed conceptual model (Figure 3.7) and the research issues (Table 3.3) related to EAI adoption in the local government authorities.

4.4.1 Research Design

The first independent phase of the empirical research methodology is the research design. Essentially, it starts with acquiring background knowledge of the area under study, reviewing the literature and identifying the problem area. Literature review (Section 2.5) indicates several research issues. This leads to a specific research area and identifies a research need. Thereafter, a conceptual model is developed (Section 3.4) to represent the intended empirical research, and the aspects of the model will be investigated through empirical studies. As demonstrated in Figure 4.1, based on literature analysis, the development of a conceptual model is conducted to represent the intended empirical research. Aspects of the model were investigated through empirical studies. Based on the needs of the empirical study, it was decided that the research design would utilise a multi-case study strategy through the employment of qualitative research methods. The justification for selecting a multi-case study strategy is given in Section 4.3.1.1. The research design was then transformed into a plan of action or protocol (see Section 4.6). Research protocols (action plans) are an essential investigation tool for various reasons, including:

- To put the task of gathering the data in an understandable and manageable format;
- To insure that all the required data is collected (irrelevant data can be discarded if not needed);
- To insure that the research follows a specific schedule and meets the target dates;
- To track the path at which knowledge was developed; and,
- Acts as a map that others may follow to achieve similar conclusions. This is needed were the issues under investigation are subjective, and the research depends on qualitative methods.

Within the protocol, a qualitative research method was developed to gather data as required by the units of analysis. The method is in the form of an interview agenda (see Appendix B), which is a series of questions relating to the units of analysis, and designed to guide the researcher, during the structured interviews. In addition to the interviews, data was collected through several sources like archival documents, minutes for meetings, consultancy reports, and the website of the organisations. The use of multiple data collection methods makes the triangulation possible, which provides stronger substation of theory (Eisenhardt, 1989). The design for the research process for this study is presented in Figure 4.1.

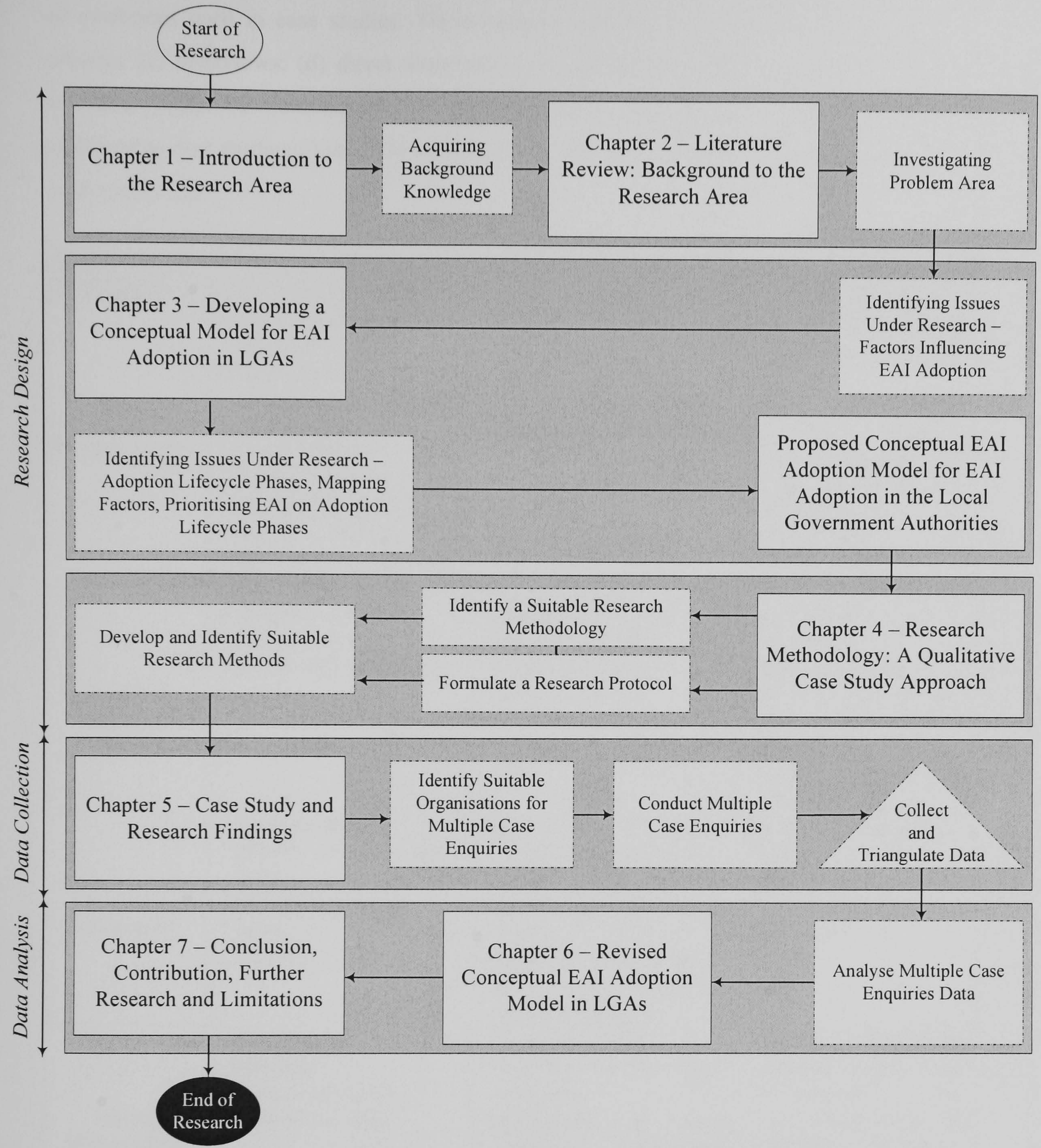

Figure 4.1: Empirical Research Framework of the PhD Process

4.4.2 Data Collection

Highly acknowledged and discussed research methods in the literature use one or more methods for collecting empirical data. Yin (1994) described these methods as 'sources of evidence'. Case study research can employ multiple data collection methods. Using multiple methods of data collection lends greater support to the researcher's conclusions and provides stronger substantiation of theory (Eisenhardt, 1989). Ideally, evidences from two or more sources will converge to support the research findings. Yin (1994) identifies several sources of evidences used in case studies. These sources include: (a) documentation; (b) archival records; (c) interviews; (d) direct observation, (e) participant observation, and (f) physical artefacts. Table 4.2 summarises: (a) strengths; and weaknesses of the main sources of evidence in case studies (Yin, 1994) and, (b) provides examples of the use of these methods in this research.

Sources of Evidence	Strengths	Weaknesses	Use of Sources in this Research
Documentation	• Stable–can be reviewed repeatedly. • Unobtrusive – not created as a result of the case study. • Exact–contains exact names, references and details of the events. • Broad coverage–long span of time, many events and settings.	• Retrievability-can be low • Biased selectivity, if collection is incomplete. • Reporting bias-effects (unknown) bias of author. • Access-many be deliberately blocked.	• Reports from the case organisation under study. • LGA White Papers. • Reference material from the relevant case organisation and other websites. • Newspaper and magazine articles.
Archival Records	• [Same as above for documentation] • Precise and quantitative	• [Same as above for documentation] • Accessibility due to privacy reasons	• Deliverables on previous interconnectivity projects within the case organisation under study. • Case organisations records.
Interviews	• Targeted-focuses directly on case study topic. • Insightful-provides perceived casual inferences.	• Bias due to poorly constructed questions. • Response bias. • Inaccuracies due to poor recall. • Reflexivity-interviewee gives what interviewer wants to hear.	• Structured interviews. • Semi-Structured interviews. • Unstructured interviews
Direct Observation	• Reality-covers events in real-time. • Contextual-covers context of events.	• Time consuming. • Selectivity-unless broad coverage. • Reflexivity-event may proceed differently because it is being observed. • Cost-hours needed by human observers.	• Formal and informal meetings with the interviewees of the case organisation for gaining additional insight.
Participant Observation	• [Same as above for direct observation]. • Insightful into interpersonal behaviour and motives.	• [Same as above for direct observation]. • Bias due to investigator's manipulation of events.	• Simple participation.
Physical Artifacts	• Insightful into cultural features. • Insightful into technical operations.	• Selectivity. • Availability.	• Hardware and software equipment.

Table 4.2: Six Sources of Evidence: Strengths and Weaknesses (Source: Yin 1994) and their Use in this Research

4.4.2.1 Interviews

According to Denzin and Lincoln (1998) interviews are regarded as the main tool of qualitative research for data collection process. Yin (1994) regards interviews as one of the most important sources of case study based research information. Moreover, while the interpretive stance is also being followed within this research, thus, interviews are viewed to be the main and appropriate source from where data has been collected. Literature indicates that interviews allow the best access to the: (a) interpretations that the participants have regarding the actions and events, which have or are taking place and, (b) the views and aspirations of themselves and other participants (Walsham, 1995b).

There are various types of interviews in existence. According to Denzin and Lincoln (1998) there are three major types namely: (a) structured; (b) semi structured and, (c) unstructured. Interviews can also be undertaken in various forms like personal interviews, face-to-face group interviewing, telephone surveys etc. The duration of an interview is not specific, as it could last as a five minutes conversation on the telephone, or it could take place over lengthy, multiple sessions (Frey and Fontana, 1991). In the context of this thesis, interviews constituted the main data source in the case organisations. Three people in each organisation under investigation were interviewed using structured (and semi-structured or unstructured) interviews. Structured interviews were based on the interview agenda presented in Appendix B. Using the interview agenda, the interviewees replied in specific questions regarding EAI adoption. Semi-structure interviews took place without the use of an interview agenda. Using this type of interviews the researcher attempted to clarify some issues that derived from structured interviews. All the structure or semi-structured interviews took place at interviewees' office. Unstructured interviews dealt with discussions that the researcher had with interviewees but without using a structured or semi-structured type of interview. The researcher had unstructured interviews during lunches, coffee breaks, out of office hours. Using unstructured interviews some important data regarding the case studies were collected (e.g. internal information regarding resistance to change).

In all the four case studies (at LGA_A, LGA_B and LGA_C), interviewees selected for structured interviews included: (a) head of IT or ICT, (b) project manager and (c) integrators, all of whom have been directly involved in the EAI projects. Such stakeholders had an important role during the decision making process for EAI adoption. Therefore, it was considered important to select a cross section of roles in the EAI projects to obtain the views of stakeholders at different levels in the organisations. This supports better understanding of the phenomenon of EAI adoption. All of the interviews were tape recorded and transcripts prepared as soon as possible after each individual interview. Tape recording supported the researcher in collecting accurate data and interpreting them without time pressures. The availability of interviewees was a problem during the case studies, since they were too busy and therefore, there was limited time for interviews. Taking notes during the interviews simply reduces the time of interviews since notes taking requires more time. Thus, the researcher considered tape recording, as a more effective way of conducting interviews. The interview agenda summarised in detail in Appendix B focuses on collecting data from the following areas:

- **Section A – General Background:** This section attempts to collect general information related to the case organisations under study. Such data include for example: (a) the status of the case organisation in the overall LGA hierarchy, (b) organisational chart, (c) the citizen strength in their community; (d) the number of citizen queries faced; (e) the number of citizens faced on daily basis (for details see Appendix B).

- **Section B – General Interviewee Information:** This section covers the basic details of the interviewee such as their name, address details, age, position in the organisation etc (for details see Appendix B).

- **Section C – Discussions on EAI Adoption Factors:** This section aims at collecting the data related to the factors influencing EAI adoption in LGAs. Data collected in this section (business information) deal with main factors reported in Sections 3.1.1 and 3.1.2 (for details see Appendix B).

- **Section D – Discussions on Adoption Lifecycle Phases:** This section aims at collecting the data related to the different phases of the adoption lifecycle. Data collected through this section deals with the phases mentioned in Figure 3.3 (for details see Appendix B).

- **Section E – Mapping and Prioritisation of Factors:** This section aims at collecting data relating to the mapping of EAI adoption factors (Sections 3.1.1 and 3.1.2) on different phases of the adoption lifecycle (Figure 3.3). Secondly, prioritising the importance of each EAI adoption factor (Sections 3.1.1 and 3.1.2) adoption lifecycle phases.

Such an interview agenda covers all important research issues that were identified in Chapters 1, 2 and, 3 and dealt with factors, adoption lifecycle phases, mapping of factors and prioritising the importance of factors influencing EAI adoption in LGAs on different phases of the adoption lifecycle. In Chapter 3, the researcher investigated and highlighted the importance on the prioritisation of factors. In this chapter, the researcher identified a suitable technique that may assist in prioritising the importance of factors influencing EAI adoption in LGAs on different phases of the adoption lifecycle. Literature indicates that several multivariate techniques e.g. Simple Multi-Attribute Rating techniques (SMAR) have been used (Salmeron and Herrero, 2005; Dutta and Burgess, 2003). However, the assessment of these techniques illustrate that they do not incorporate the preference structure of the decision-maker. According to Salmeron and Herrero (2005), preference structure is to report the perception of decision-makers, about a single or number of factors.

Other efficiency techniques are also available e.g. Salmeron and Herrero (2005) report that these techniques are used to measure and evaluate the performance efficiency of different Decision Making Units (DMU). Decision making units can be of very different nature, like a computer system, a productive unit, a school, etc. This efficiency is measured according to the amount of resources, or inputs, involved in the process and the amount of outputs produced. The efficiency of a given unit is higher than the efficiency of another if it can get more outputs out of the same or less amount of inputs or if it can get the same amount of outputs out of a small amount of inputs. For example, Data Envelopment Analysis (DEA) technique measures the efficiency rate by the ratio of a weighted sum of outputs over a weighted sum of inputs (Salmeron and Herrero, 2005). The weights can take any value. In DEA, this value is the best set of weights that would make the unit as efficient as possible.

Therefore, the weight or the importance given to each criterion is different for each unit. The weights given to each of the criteria may take any value and none of them can be considered more important than any other. Nevertheless, these methods are more appropriate when the decision-maker has no clear preferences over the different factors, or when the interest is focused on getting technology that performs better independent of personal preferences. Similarly, additional techniques were reviewed for example including among others: Ranking Approach [RA] (Buss, 1983), mathematical optimisation such as non-linear programming model and 0-1 goal programming model (Badri *et al.,* 2001; Santhanam and Kyparisis, 1996), Analytical Network Process (Lee and Kim, 2000). However, applicability of these methods is often weakened by sophisticated mathematical models or limited attributes to carry out in a real world decision e.g. in the context of this research – EAI adoption decision, especially when some factors are not readily quantifiable, as well as not too easy for managers to understand. On the other hand AHP technique illustrates how to determine the priority of a set of alternatives and the relative importance of attributes in a multi-criteria decision-making problem (Wei *et al.,* 2005; Saaty, 1980). Based on the review of the aforesaid techniques, Table 4.3 summarises the characteristics of AHP, SMAR, DEAT, RA and ANP.

Characteristics Differentiating the Prioritisation Techniques	Prioritisation Techniques				
	AHP	SMAR	DEA	RA	ANP
Incorporation of preference structure	✓	–	–	–	–
Synthesised analysis of diverse judgements	✓	–	–	–	–
An intuitive technique	–	–	–	✓	–
Optimising resource allocation for interaction of factors	✓	–	✓	–	✓
Limited attributes to carry out real world decisions	–	✓	✓	✓	✓
Captures individual knowledge and experience	✓	✓	–	–	–
Gives easy understanding of problem situation	✓	–	–	–	✓
Time-consuming process	–	–	–	–	–
Non-linear representation	–	–	–	✓	–
Managing large amount of qualitative/quantitative data	✓	–	–	–	–
Applicability weakened by complex mathematical models	–	–	–	✓	✓
Easy understanding of the prioritisation process	✓	✓	–	✓	–
Quick insight into structure of information	✓	✓	–	–	–
Requires less skill and training	✓	✓	✓	✓	✓
Measure the performance efficiency of decision makers	–	✓	✓	–	–
Structures through symbolic and numeric representation	✓	✓	–	–	–
Supports different viewpoints through rich pictures	✓	–	–	–	–
Techniques not appropriate for all situations	✓	✓	✓	✓	✓
Too much focus on quantifiable calculations	–	✓	✓	✓	✓
Providing a step-wise guideline for prioritising the factors	✓	–	–	–	✓
Accessible data format	✓	–	✓	–	–
Graphical representation	✓	–	–	–	–
Resolves complex problems of choice and prioritisation	✓	–	✓	–	✓

Table 4.3: Characteristics Differentiating the Prioritisation Techniques

Based on the analysis presented in Table 4.3, the researcher has found AHP technique is especially useful that allows decision-makers to express their individual preferences and tackle the complex problems of choice and prioritisation (Saaty, 1977). This allows each decision maker to choose (according to his/her preferences) that a specific factor is more important over other. This shows that AHP has the advantage of a detailed stepwise comparison mechanism over other techniques, i.e. the ability to check for and to reduce any inconsistency scores there and then, and also the opportunity in one exercise to obtain decision-makers prioritisation responses (Salmeron and Herrero, 2005; Chin *et al.,* 1999; Saaty, 1980). AHP is a flexible decision-making technique that is used to set priorities among different factors and solving complex decision problems (Saaty, 1980). Complex decision problem can be decomposed into several sub-problems using the AHP technique, in terms of hierarchical levels where each level represents a set of factors relative to each sub-problem (Chin *et al.,* 1999). This may enable to reduce the assessment bias.

AHP has been extensively used in the field of information systems to reflect the importance, or weights, of the factors associated to priorities (Khoo *et al.,* 2002; Chikara and Takahashi, 1997; Lee, 1993) with plethora of AHP applications reported in the normative literature (Wasil and Golden, 2003; Zahedi, 1986). AHP employs both qualitative and quantitative approaches to solve decision problem. Qualitatively, a complex decision problem is decomposed into a hierarchical structure. Quantitatively, it adopts pair-wise comparisons to rate the decision elements (Cheng and Li, 2002). Based on the analysis of the AHP technique, Table 4.4 summarises the reasons for selecting AHP technique for prioritising the importance of EAI adoption factors on adoption lifecycle phases.

Reasons for Selecting AHP Technique	References
• Synthesised analysis of diverse judgements • Tackles complex problems of choice and prioritisation • Employs redundant comparisons to ensure validity of judgements	Lam and Chin, (2005); Saaty, (1994)
• Applies to both the qualitative and quantitative approaches	Cheng and Li, (2002)
• Allows managers to express individual preferences • Flexible decision-making process to set priorities among different factors • Decomposes complex problems into smaller sub-problems • Reflects the importance, or weights, of the factors associated to priorities	Salmeron and Herrero, (2005); Saaty, (1997)
• Provides a detailed stepwise comparison mechanism • Ability to check for and to reduce any inconsistency	Jackson, (2001)
• Provides a flexible and easily understandable way of analysing problems • Allows subjective as well as objectives factors to be considered for analysis	Huang *et al.*, (2004)
• An important approach to multi-criteria decision-making problems of choice • Easy of use and over-specification of judgements • Built in consistency tests • Use of appropriate measurement scales • Accessible data format and logical means of synthesising the judgements	Lai *et al.*, (1999); Saaty, (1980)
• Determines the priority of a set of alternatives and the relative importance of factors	Wei *et al.*, (2005); Saaty, (1980)
• Enables to reduce the assessment bias	Chin *et al.*, (1999)

Table 4.4: Reasons for Selecting the AHP Technique

Nonetheless, to the best of researcher's knowledge, there is no literature evidence that presents a formal technique to prioritise EAI adoption factors at each phase of the adoption process in LGAs. In the previous EAI adoption studies (Mantzana, 2006; Khoumbati, 2005; Chen, 2005 and Themistocleous, 2004), the researchers although have proposed several factors, nonetheless, none have prioritised the importance of EAI adoption factors. In the context of this research, prioritising EAI adoption factors in LGAs is another contribution to the theory. In doing so, the researcher proposes AHP technique for it. The researcher does not argue that this is the best technique but there is plethora of references (Table 4.4) supporting that AHP can be used to prioritise the factors based on their importance (e.g. Salmeron and Herrero, 2005; Chin *et al.,* 1999; Saaty, 1980). Although, some may argue against the use of AHP, the reason is that of certain measurement problems and computation of priority values is based on the classical eigenvalue problem (Dutta and Burgess, 2003; Goodwin and Wright, 2000). However, there is no controversy about this problem (Saaty, 1994). Thus, the researcher uses the AHP technique in this thesis to prioritise the importance of EAI adoption factors on adoption lifecycle phases in LGAs. AHP can support the decision making process as it may result in more informed practices and speed up the EAI adoption in LGAs.

The researcher discusses on the basic steps of AHP technique to prioritise EAI adoption factors on different adoption lifecycle phases. The AHP technique encompasses four basic steps: *Firstly*, the top level of the entire hierarchy represents the goal (EAI adoption in LGAs) of the decision problem. This decision problem has to be broken down into a hierarchy of interrelated elements. *Secondly*, in the intermediate level the data has to be collected by pairwise comparisons by interviews. *Thirdly*, determining normalised priority weights of individual EAI adoption factors and finally, analysing and calculating the priority weights. Decision elements at each hierarchy level are compared pairwise and are assigned relative scales that reflect the strength with which one element dominates another. *Fourthly*, based on these pairwise comparison matrices, local and global priority weights are determined and the ranking of the alternatives occupying the last level of the hierarchy are made to satisfy the overall goal of the problem (Chin *et al,* 1999). AHP allows decision makers to model a complex problem in a hierarchical structure showing the relationships of the goal, objectives (criteria), sub-objectives, and alternatives (Figure 4.2) with four basic steps are described as:

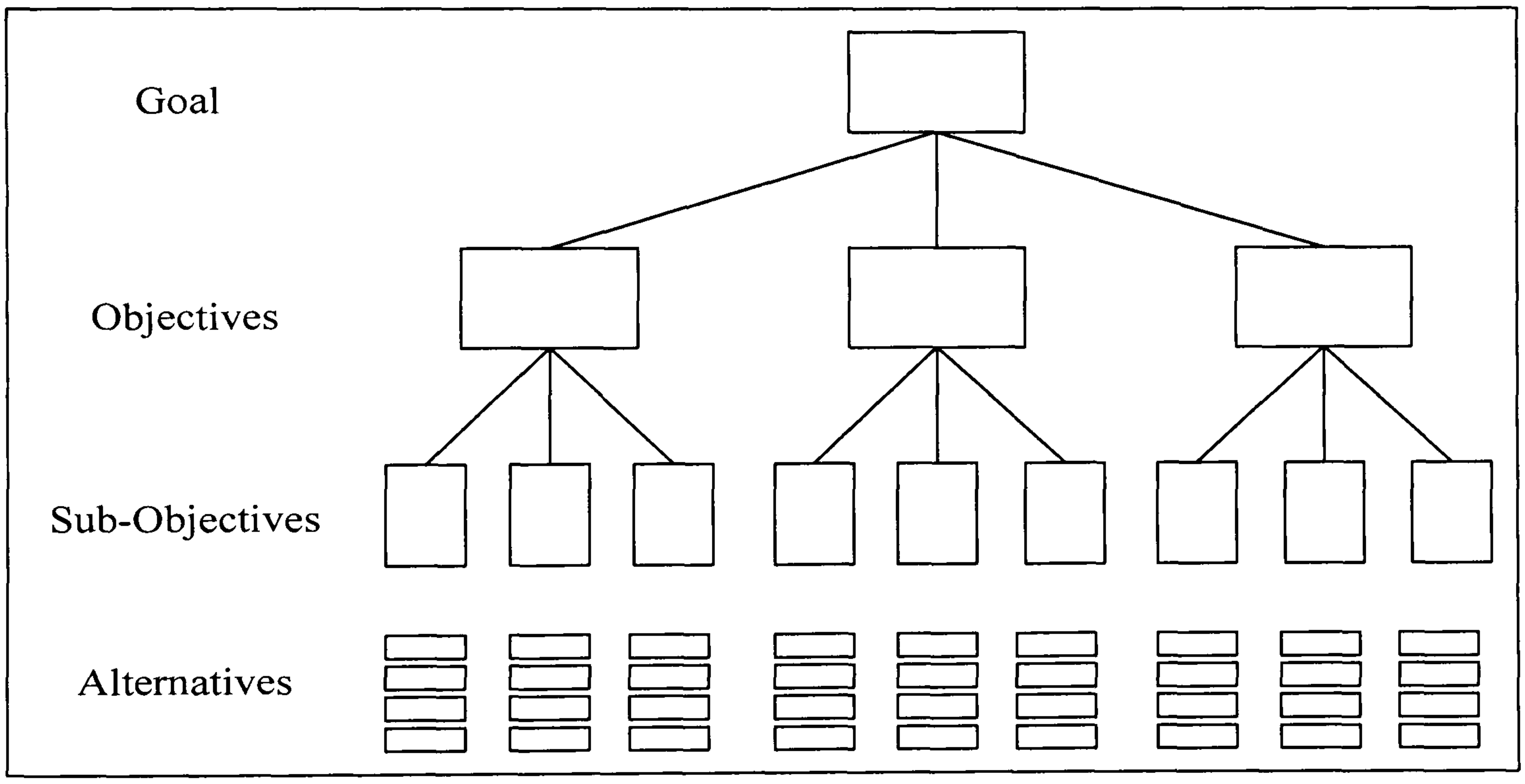

Figure 4.2: Decision Hierarchy (Source: Forman and Selly, 2004)

- **Step 1 – Constructing the Hierarchy Model:** In order to study the prioritisation of EAI adoption factors (as reported in Figure 3.2), the researcher established a category of factors: (a) Organisational Factors (OF), (b) Technological Factors (TF), (c) Support Factors (SF), (d) Financial Factors (FF), and (e) Pressure Factors (PF) as illustrated in Figure 4.3. The determination of the degree of importance associated to the EAI adoption factors can be resolved by decomposing it into sub-problems within a hierarchy structure. The highest level with only one element is the goal (level1) to reach and the elements in the middle levels are the factors (level 2 – decision criteria) for mapping and prioritising the importance of EAI adoption factors in the lowest level (level 3 – sub criteria).

The elements in the middle level are the factors such as: Formalisation (F), Centralisation (C*), Managerial Capability (MC), Benefits (B*), Barriers (B), Size (S), Technological Risks (TR), Evaluating Frameworks (EF), Data Security and Privacy (DSP), IT Infrastructure (ITI), Personnel IT Knowledge (PITK), IT Sophistication (ITS*), Top Management Support (TMS), IT Support (ITS), Higher Administrative Authority (HAA), Cost (C), Return On Investment (ROI), Project Champion (PC), Critical Mass (CM), Market Knowledge (MK), and Citizen Satisfaction (CS). In this section, the hierarchy of the factors (Figure 3.2) was classified into three levels as depicted in Figure 4.3.

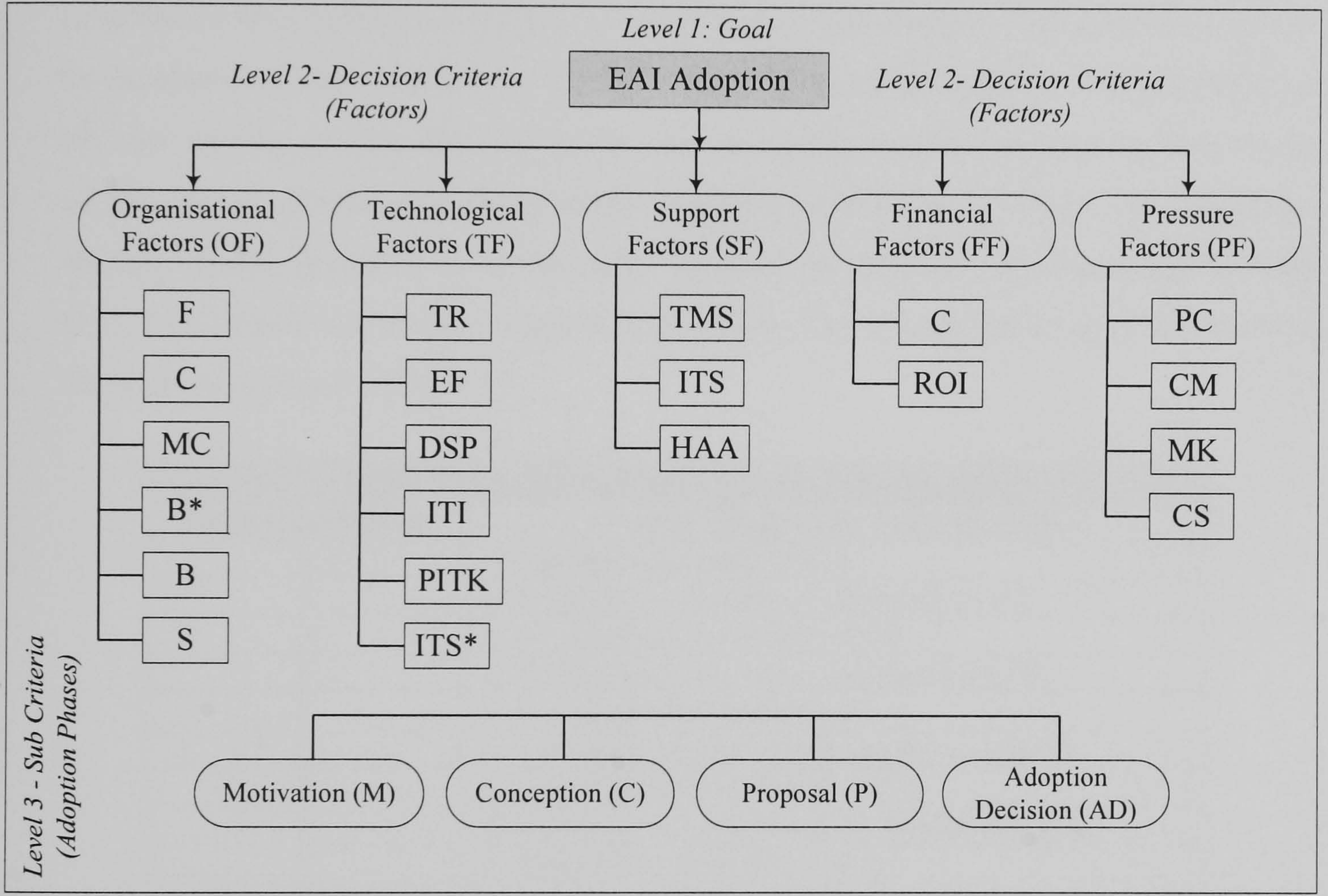

Figure 4.3: EAI Adoption Factors Hierarchy Model

The researcher does not aim to assess more complex factors e.g. information needs or interests of the individuals in an organisation. The reason is that it is difficult to get a reliable measure of such factors just by interviewing. The rationale is to obtain the decision makers' perceptions about the importance of EAI adoption factors in order to establish an importance level among them. In doing so, it will assist the researcher in identifying the importance of each factor. It is a valuable effort, since IS users and IS experts have significantly different perceptions on IS success (Jiang *et al.,* 2002). Once the researcher has selected all EAI adoption factors and have defined a hierarchy among them (Figure 4.3), the following step within the AHP method is focused on collecting data by pairwise comparisons of the different category. Making pairwise comparisons is a more reliable way of obtaining the actual weights than obtaining them directly as it is generally easier to evaluate the relative weights of each factor with respect to the others.

- **Step 2 – Collecting Data Through Pairwise Comparison by Interviews:** Yang and Huang (2000) reported that this phase can be described into three stages. Firstly, the computation of the different weights by asking the importance of each factor with respect to each of the others through pairwise comparisons. The second step consists of the computation of a vector of priorities and the third step is to measure the consistency of the judgments of the answers. In the first step, the EAI adoption factors will be compared in terms of their importance within a given category. The factors of all categories have to be compared within their own category. Several ways of making the comparisons exist and the number of them depends on the trust the decision-maker puts on the consistency of the human group being interviewed (Salmeron and Herrero, 2005). The researcher used the widely accepted nine-point scale which is the original scale suggested by Saaty (1977) to conduct a pairwise comparison of factors. The meaning of each of the values of the scale is shown in Table 4.5.

Pairwise Comparison scale for AHP Preferences	
Numerical Rating	**Verbal Judgements of Preferences**
1	A is equally preferred over B
2	A is equally to moderately preferred over B
3	A is moderately preferred over B
4	A is moderately to strongly preferred over B
5	A is strongly preferred over B
6	A is strongly to very strongly preferred over B
7	A is very strongly preferred over B
8	A is strongly to very extremely preferred over B
9	A is extremely preferred over B

Table 4.5: Pairwise Comparison scale for AHP Preferences (Source: Saaty, 1977)

Pairwise comparisons are basic to the AHP technique. When comparing a pair of factors, a ratio of relative importance, preference or likelihood of the "factors" can be established. This ratio does not need to be based on some standard scale such as feet or meters but merely represents the relationship of the two "factors" being compared. For example, when comparing two factors, it can be judged (without any scientific measurement) that one factor may be more important then the other factor, or twice as important as the other factor. This may be a subjective judgment, but the two factors can be compared as such. Most individuals would question the accuracy of any judgment made without using a standard scale. Yet, it has been verified that a number of these pairwise comparisons taken together form a sort of average, the results of which are very accurate. This "average" is calculated through a complex mathematical process using *eigenvalues* and *eigenvectors*. The results of this method have been tested experimentally and have been found to be extremely accurate (Forman and Selly, 2004).

Several ways of making the pairwise comparisons exist and the number of them depends on the trust the decision-maker puts on the consistency of the human group being interviewed. The most common one requires from the interviewed group to provide a rate, w_{AB}, regarding the importance of a factor, A, in comparison to the importance of another factor of the same category, B. Then, the reciprocal comparison, the rate of the importance of factor B over A, is deduced from the previous (and is given by $1/w_{AB}$). This procedure reduces the number of comparisons for the interview to n (n-1)/2, where n is the number of factors in that category. The researcher follows this procedure in this thesis as reported by (Salmeron and Herrero, 2005).

By using this procedure, there are no symmetric inconsistencies (the importance of B over A will always be consistent with the importance of A over B). However, the transitive property may not be hold (i.e., the degree of importance of A over B does not have to be consistent with the importance of A over C and C over B). Thus, the possibility of potential inconsistencies has to be analysed. The researcher used the widely accepted nine-point scale which is the original scale suggested by Saaty (1977). The meaning of each of the values of the scale is shown in Table 4.3. The inverse but analogous scale is used for B being preferred to A i.e. if for example, B is moderately to strongly prefer over A, then this rate signifies the importance of A over B as 1/4.

Note that this implies that zero cannot be included in the scale for pairwise comparisons (1 is the middle of the scale, meaning equal preference of the two attributes being compared). The numerical values representing the judgements of the pairwise comparisons are arranged in the upper triangle of the square matrix (Salmeron and Herrero, 2005). For example, a_{ij} represents how much criteria i is preferred over criteria j. This means that: $a_{ij} = w_i / w_j$. The elements in the main diagonal of A are all equal to 1 and the elements of the down triangle are the inverse of the elements in the upper triangle (i.e., $a_{ji} = 1/a_{ij} = 1/ (w_i/w_j) = w_j/w_i$). Each of its elements, a_{ij}, is the ratio of the absolute weight relative to the importance of criteria i over the absolute weight relative to the importance of criteria j. The matrix becomes: $A = (a_{ij}), (i, j = 1,\ldots, n)$; A

$$= \begin{bmatrix} 1 & \cdots & a_{ij} \\ \cdots & 1 & \cdots \\ 1/a_{ij} & \cdots & 1 \end{bmatrix}$$

That is:

$$= \begin{bmatrix} 1 & \cdots & w_i/w_j \\ \cdots & 1 & \cdots \\ w_j/w_i & \cdots & 1 \end{bmatrix}$$

Note that the elements of this matrix reflect the importance of each factor with respect to another. However, the researcher is interested in knowing the value of the weight of each factor in itself (the vector of priorities), not the weights when compared to the other factors. This is done in the next step of the analysis. Note also that this matrix verifies that: $Aw = nw$, where w is the vector of the actual absolute weights and n is the number of criteria. The researcher uses the above equality to get the weights of each factor. It has been proved that n is the largest eigenvalue of matrix A (Saaty, 1977) and that the vector of weights the researcher is looking for is the eigenvalue associated to this value. These weights are called the local weights, i.e. the weights within the category they belong to. If there is an upper category, then the absolute weights are given by multiplying the weight of the attribute above by the local weights (Salmeron and Herrero, 2005). By doing this, the researcher can get a normalised set of weights for all the factors in the lower category.

Hence, the researcher needs to calculate the eigenvalues of this matrix, consider the largest one and calculate the associated eigenvector that would be the relative weights the researcher is looking for. The calculation of eigenvalues and eigenvectors is a simple and common procedure in mathematics. This can be computed using mathematical software expert choice for computing the categories' weights. These weights must verify that: $Aw = \lambda_{max}w$, where λ_{max} is the largest eigenvalue of A and w is the eigenvector associated to that eigenvalue. The value $\lambda_{max} = n$ should always be the largest eigenvalue of A. However, inconsistencies in the answers of the people interviewed may lead to a different value i.e. closer to n, the greater the consistency of the answer. A normalised consistency ratio, based on the divergence of the largest eigenvalue to n, is commonly used in the literature (Zahedi, 1986). The closer the consistency ratio is to zero the greater the consistency. As was stated before, the equality $a_{ij} = 1/a_{ii}$ holds by construction. The answers are consistent if the equality $a_{ij} \cdot a_{jk} = a_{ik}$ holds for all factors. That is, if the transitive property holds (the preference of A over B is equal to the preference of A over C times the preference of C over B).

If this equality does not held for a given decision-maker, it means that the decision-maker is not consistent in his/her statements and the interview should be done again. In practice, the weights are considered valid if both terms of the equality do not differ much; otherwise the answer of the decision-maker under analysis is either eliminated from the dataset or the questions regarding the attributes involved in the equality have to be redone. The maximum accepted upper value for the consistency ratio is 0.1 (Zahedi, 1986). This measure of consistency can be used to evaluate the consistency of decision-makers as well as the consistency of all the hierarchy Yang and Huang, (2000) or even or the possibility that the matrix was filled at random.

- **Step 3 – Determining Normalised Priority Weights of EAI Adoption Factors:** The pairwise comparison judgements obtained from the interviews are translated into the largest eigenvalue problems that can be solved to obtain the normalised and unique priority vectors of weights to decision criteria (Level 1) and/or sub-criteria (Level 2) used in the hierarchy model (Figure 4.2). This can be computed using mathematical software – Expert Choice (EC) software for computing the categories' weights. EC is an AHP-based multi-objective decision support tool. It is designed for the analysis, synthesis and validation of complex individual or group decisions (Saaty, 1986). As suggested by Saaty (1986), the geometric mean approach, instead of the arithmetic approach, are used to combine the pairwise comparison judgement matrices obtained from each interview. The overall Consistency Ratios (CR) of pairwise comparison judgement matrices (individual and combined) at all levels needs to be well within the value of 0.10 as recommended by Saaty (1986), which implies that all interviewers are consistent in assigning relative scales. Salmeron and Herrero, (2005) reports that conducting interviews instead of sending a questionnaire would enable us to resolve any problems confronted regarding the inconsistencies in judgements that are provided by the interviewers. The interviews can be conducted again to resolve any problem much faster.

- **Step 4 – Analysing and Calculating the Priority Weights:** Based on the normalised priority weights obtained from the previous step, the relative importance of EAI adoption factors will be assessed in the subsequent chapters. It should be noted that the priority weights that will be obtained by using the EC software and the conclusions drawn from them will be the results of the analysis of collective judgements provided by the panel of interviewees selected for this research.

4.4.3 Data Analysis

Empirical data derived from case studies were triangulated and then analysed to draw empirical conclusions. A difficulty in using qualitative data is that the methods of analysis are often not well formulated (Miles and Huberman, 1994). Thus, it appears that although the process of qualitative data analysis takes several forms but in essence it is non-mathematical. During this study, data analysis has involved examining meaning of people's words and actions. Similar to other studies (e.g. Ramanath, 2000) the research findings of this study are derived from the empirical data. Empirical evidences were then used to draw conclusions and resulted in the formulation of a model for EAI adoption in LGAs.

4.5 Data Triangulation

Validity and reliability of the empirical research findings is another vital issue that concerns interpretive researchers. According to Denzin, (1978) the term that is related with such issues is that of triangulation as means of validating the results. Denzin (1978) suggested that there are four types of triangulation namely: (a) data, (b) investigator, (c) theory and, (d) methodological, whereas, Janesick (2000) added a fifth type called interdisciplinary triangulation. Data triangulation means the use of variety of data sources in a study (Denzin, 1978). The second type of triangulation is the investigator triangulation, which is the use of several different researchers or evaluators (Janesick, 2000). Theory triangulation refers to the use of multiple theoretical perspectives to interpret a single set of data (Denzin, 1978). Methodological triangulation means the use of multiple methods to study a single problem. Finally, interdisciplinary triangulation is related with the investigation of issues related with more that one disciplines (Janesick, 2000). From these definitions, it can be concluded that data, methodological and interdisciplinary triangulation are being used in this research and these results are summarised in Table 4.6.

Local Government Authority	Type of Triangulation Applied	Sources	
LGA_A	Data	• Reports, • White papers • Interviews	• Deliverables • Organisational records • Observations
	Methodological	• Documentation • Archival records • Interviews	• Observations • Physical artefacts
	Interdisciplinary	• Information Systems	• Management • Culture
LGA_B	Data	• Reports, • White papers • Interviews	• Deliverables • Organisational records • Observations
	Methodological	• Documentation • Archival records • Interviews	• Observations • Physical artefacts
	Interdisciplinary	• Information Systems	• Management • Culture
LGA_C	Data	• Reports, • White papers • Interviews	• Deliverables • Organisational records • Observations
	Methodological	• Documentation • Archival records • Interviews	• Observations • Physical artefacts
	Interdisciplinary	• Information Systems	• Management • Culture

Table 4.6: Types of Triangulation Used in the Research

Initially, questions relating to the role of individuals, organisational background and general facts about the project were asked. These questions were open-ended, as the researcher wanted to obtain as much information as possible and not limiting the respondent in any way. In some cases this has led interviewees to report issues that had not taken into consideration by the researcher (e.g. support factors) during the designing of interview-agenda.

4.6 Case Study Protocol: An Operational Action Plan

In studies where the empirical inquiry is subjective and based on irregular data collecting tools, then, researchers discuss the importance of having a case study protocol, as a scientific path of the research that needs to be developed to allow other researchers to follow the same pathway of data collected, and ultimately, conclusions derived (Irani *et al.,* 1999). As such, the case study protocol represents an official document that an investigator uses to schedule data gathering dates, to specify the means by which it will be gathered, and to detail the objectives and procedures of the analysis. Yin (1994) describes a case study protocol as a tool that would operationalise the research, acting as an action plan, and setting rules and regulations by which data would be gathered. The protocol acts as a data collection tool, where data are derived from case studies.

Yin (1994) suggests that the set of case study questions is an important element of the case study protocol. The main purpose of questions is to maintain the researchers focus. In the present study, a set of interview questions were developed prior to the empirical enquiry (Appendix B). The questions were broad and aiming at open answers, following the intent of the research questions. Yin (1994) proposes that case studies may have questions at five levels as presented in Table 4.7. He added that a case study protocol will outline: (a) the case study overview, (b) fieldwork research procedures, (c) questions addressed by the research, and, (d) the research output format. As such this research will adopt the outline suggested by Yin (1994), and this chapter will address level 1, 2 and 3 questions, with other parts of the research addressing the remaining levels.

Question Level	Research Questions	Thesis References
Level 1	Questions asked of specific interviewees.	• Section 4.4.2.1 / Appendix B
Level 2	Questions asked of an individual case study.	• Sections 4.6.1, 4.6.2, 4.6.3
Level 3	Questions asked across multiple case studies.	• Section 4.6.3
Level 4	Questions asked of entire study	• Section 1.5
Level 5	Questions about the recommendations and conclusions beyond the scope of the study	• Sections 7.1, 7.7

Table 4.7: Questioning Levels in a Multiple Case Enquiry (Source: Yin 1994)

4.6.1 Case Study Overview

The researcher suggests that it is not the intention of this research to offer prescriptive guidelines to EAI adoption but rather, describe case study perspectives that allow other researchers to relate their experiences to those reported. Hence, this thesis offers a broader understanding of the phenomenon of EAI adoption in LGAs. In the section of the case study protocol, the research issues under investigation are detailed, to assist the researcher in focusing on the main questions that need to be studied. These are factors, adoption lifecycle phases, mapping and prioritising the importance of factors on different phases of the adoption lifecycle that the researcher needs to focus on, to generate data that is required to investigate EAI adoption in LGAs. The consideration of these issues are crucial, to retain focus during the interviews. These issues are the following:

- To identify the EAI adoption decision-making process used by the case study organisations,
- To identify organisational, technological, support, pressure, and financial factors associated with EAI adoption,

- To identify the phases of the adoption lifecycle and how each factor may influence EAI adoption in LGAs on different phases of the adoption lifecycle,

- To prioritise the importance of EAI adoption factors on different phases of the adoption lifecycle,

- To identify the suitability of these factors for inclusion in a conceptual model for EAI adoption in LGAs.

4.6.2 Fieldwork Research Procedures

In conducting a case study research, Yin, (1994) reported that the fieldwork research procedures should be properly designed, since the researcher will be collecting data from people and organisations in their everyday situations i.e. natural (real-life) setting, not within a laboratory, or through a rigid questionnaire. This means that the researcher needs to take into consideration and cope with 'real world' events such as respondents for interviews not willing to participate, documents related to the project not being available on time etc. It is understandable that the appointments with interviewees will be scheduled before time, and documents can be requested ahead of time, but this cannot be guaranteed in practice. Furthermore, interruptions during the interviews are expected, and documents may not be available, but that should not stop the researcher from data collection.

Thus, a fieldwork research procedure needs to be designed to deal with such events. This section of the protocol presents those procedures that will be employed during the multi-cases study investigation. These procedures are: (a) to identify case organisations that have adopted EAI, (b) to identify which and how many respondent within the organisation needs to be interviewed, (c) identify appropriate data gathering research methods and establish line of inquiry, (d) develop an interview schedule and (e) discussed on the confidentiality of the information provided and identity of the case organisation.

4.6.3 Issues Addressed by the Research

In maintaining focus on the task of data collection, a set of questions was developed. These questions are set for the researcher and not for the interviewees and act as a reminder for the researcher, concerning the data. This data is essential to be collected to investigate EAI adoption in the local government authorities. Interviewees are not exposed to these questions, but were used for consultation before and during the interviews to maintain some form of structure to the interview. Essentially, the main purpose of the protocol questions is to keep the researcher focus during the data collection process. The researcher will have an opportunity to review key questions that the interview should address. For this, four issues are developed to be asked from interviewee and represent part of the questions level 2 in Table 4.7. Table 4.8 summarises these research issues and their relevant questions.

Proposed Research Issues and their Relevant Questions for Further Investigation	
Research Issues	**Description**
EAI Adoption Factors	• What are the factors that influence the decision-making process for EAI adoption in LGAs?
Adoption Lifecycle Phases	• What are the different phases of the adoption lifecycle for EAI adoption process?
Mapping of Factors	• What factors influence EAI adoption at each phase of the adoption lifecycle?
Prioritising the Importance of Factors	• What is the importance of each factor over the other factors at each phase of the adoption lifecycle for EAI adoption process?

Table 4.8: Research Issues Addressed by the Empirical Inquiry

4.6.4 The Research Output Format

Chapter 5 presents the empirical data analysis, and the format at which the output of the empirical inquiry will take. The consideration of the format that the research output should take proved useful, as large amounts of data would be gathered during each case study visit. The researcher addressed issues associated with large amounts of data likely to be generated, through aligning each question within the interview agenda (Appendix B). This approach contributed to the quality of the research output, as it focused on the development of an effective interview agenda (Appendix B) for the investigating on the research issues illustrated in Table 4.8.

4.7 Conclusions

The aim of this chapter is to propose a rational for the use of an appropriate research methodology for this thesis. This chapter presents the research methodology to be applied within this thesis. This does not only provide the research process with a well-developed framework but provides an understanding in the broadest possible terms. A discussion of the epistemological stances and their suitability was initially provided. In doing so, the researcher has justified the use of an interpretivism stance for the research presented in this thesis. The reason for this decision is based on the aim and objectives of this research as described in Section 1.3 and deals with the development of a model for EAI adoption in LGAs. Thereafter, quantitative and qualitative research approaches are discussed. The researcher suggests that in the context of this research qualitative approach is more appropriate for the reasons explained in Section 4.2. Such reasons include that qualitative approach can be used to: (a) investigate little known phenomena like EAI adoption in LGAs; (b) examine in depth complex processes (EAI adoption); (c) examine the phenomenon in its natural setting and, (d) learn from practice.

In Section 4.3, the types of research strategies that are available and reasons for selecting particular ones were provided. Thus, the use of case study strategy in this research was justified and explained in Section 4.3.1. Furthermore, multiple case studies are used within this research to explore and understand the phenomenon of EAI adoption. In addition, the use of research methods was outlined and discussed and arguments for the suitability of particular methods were provided. Thus, various methods for data collection are used by the researcher during this research including among others: (a) interviews, (b) documentation, (c) observation, (d) archival records and physical artifacts. Then, Sections 4.4 and 4.5 reported the: (a) empirical research methodology followed in this research and, (b) data triangulation respectively. Thereafter, Section 4.6 presents the case study protocol for this research. This protocol can be used as an important tool that acts as an operationalised action plan for the empirical enquiry. Based on this protocol the researcher will use case study perspectives to allow others to relate their experience to the outcome of this research. Thus, the work presented in this thesis will provide a broader understanding of the phenomenon of the enterprise application integration adoption in the local government authorities.

5

Chapter 5: Case Study and Research Findings

Summary

In the previous chapter, the researcher justified and analysed the research methodology employed in this thesis. This chapter applies the research methodology to test the proposed conceptual model (Figure 3.7) for EAI adoption in the local government authorities. In doing so, the researcher presents and analyses the empirical data collected from three local government authorities within the UK. The researcher covers three case organisations, as this was found to provide enough information (i.e. two projects within the first case organisation and one project each within other two case organisations) that assisted the researcher in justifying the research presented in this thesis. Selecting of a fourth case organisation could have given marginal benefits to this work. However, as discussed at the end of this chapter, this was seen to be unlikely. The objective was to present the preliminary research findings obtained while observing phenomena in the organisational settings.

The data collected are used to test: (a) the proposed EAI adoption factors (Figure 3.2), (b) the adoption lifecycle phases (Figure 3.3), (c) the mapping and prioritisation of factors on different phases of the adoption lifecycle as illustrated in Sections 3.2 and 3.3. Nonetheless, the analysis of the empirical data should not be seen as a comparison among cases. Instead, this chapter offers an empirical analysis of different case study perspectives that describes human and organisational behaviour and perceptions during the adoption of EAI. Consequently, rather than generalising the results of these cases, the researcher proposes to examine each case by describing respective approaches to EAI adoption in the local government authorities. In doing so, allowing others to draw parallels in the outcome. This chapter commences by providing background to the establishment of local government authorities in the UK. The chapter then moves to a detailed presentation of the three case organisations. The empirical results derived from the case organisations have confirmed the validity of the conceptual model presented in Chapter 3.

5.1 Background to the Establishment of LGAs in the UK

Local government authorities in the UK provide direct support to meet a diverse range of citizens' needs including housing, social services, education and the management of a complex service infrastructure that supports communities and business (Johnson and King, 2005). The diversity of the local government domain can be traced to a complex legacy of institutional and political arrangements within which the local public services (e.g. social services) are embedded and within which they need to evolve (Bevir *et al.,* 2003). While LGAs have traditionally been responsive to the needs of their citizens through the process of democratic accountability, they continue to exist through the consent of parliament (Davison and Grieves, 1996). However, as central government cannot directly exercise control over local services in an effective way, LGAs have come to provide a range of services which include three principal functions of: protection (e.g. police, fire services, consumer advice etc), welfare (e.g. personal social services etc), and convenience (e.g. parks, recreation, collection of refuse etc) (Johnson and King, 2005). Historically, these functional services emerged in response to requirements of accountability to the localities in which they existed. Their provision required the need to adopt services in different ways to different localities.

The history of LGAs therefore reflects the need to respond to special situations. For example, during the nineteenth century the focus in urban areas was on "improvement" with the desire to transform the quality of urban life as well as the civility of the urban populace (Mellor, 1976). Influenced by social, economic and political changes in the early nineteenth century dramatic changes to the structure of LGAs began to occur. In 1835, for example, the Municipal Corporations Act was created. This Act formed the basic structure of the present LGAs, the main thrust of which was the formation of elected town councils empowered to undertake the general administration of their areas. This illustrates that whilst being a significant part of the UK public sector; LGAs are independent from central government and most have long histories with considerable autonomy under a variety of governance arrangements. The result is that each LGA has developed its own organisational, bureaucratic and more recently IT solutions to match their internal needs. It is not surprising that LGAs display enormous variations in the way that their processes to provide public services are implemented. This variety presents a unique and potential challenge for providing government services electronically (Johnson and King, 2005).

Over the past two decades, the transformation and reform of LGAs has been a key feature of the political programmes of the UK Government (Johnson and King, 2005; Kamal, 2004). The UK Government's Modernisation and Improvement agenda aims to develop LGAs that are more dynamic, entrepreneurial, efficient, effective and in touch with their citizens (Newman *et al.*, 2001). In 2003/4 nearly one quarter of all UK e-Government spending was by LGAs - total spend on e-Government was £12.2 billion in 2003/4 of which £2.9 billion was by LGAs (KableNet, 2005). This spending on e-Government by LGAs has been largely under the auspices of the Office of the Deputy Prime Minister (ODPM), which believes that e-Government is indeed helping to transform LGAs the quality of local services making them "more accessible, convenient, responsive, and cost-effective" (ODPM, 2002). The ODPM funded a range of innovative projects to explore many of the practical aspects of e-Government under the Pathfinder and National Projects programmes. However, the primary mechanism for controlling the investment in e-Government has been based on linking funding to each LGA's self-completed declarations of progress towards a target of becoming "100% e-enabled". Due to the deadline, the definition was modified to "100% capability in electronic delivery of priority services" (ODPM, 2004) and there was a growing recognition even if technical compliance with the targets is achieved this will be insufficient to deliver the deeper process transformations that are at the heart of the e-Government agenda.

Despite the transformations and reforms in LGAs in the last two decades, citizens still consider LGAs as a hierarchical bureaucracy (Margetts, 2003) and bureaucracies are often criticised for their rigidity, inefficiency and inability to serve clients (Ho, 2002). However, e-Government is seen to offer an opportunity to create a new mode of public services where all public organisations deliver a modernised, integrated and seamless service for their citizens (Silcock, 2001). According to Margetts (2003), just as Max Weber's followers viewed bureaucracy as the basis of modernism in the first half of the 20th century, advocates of e-Government have seen IT as the basis of modernism in the second half and beyond. In the UK, the central government is committed to achieve "Information Age Government" (Mower, 2001) – IT is expected to displace bureaucracy as the primary vehicle for affecting the delivery of services leading simultaneously to cost reductions and service improvements.

In the UK LGAs, e-Government agendas need to be focused more clearly on carefully designed approaches that will deliver a more complex set of outcomes and move beyond information provision through websites to enable citizens to interact and transact via multiple channels. The central government's strategy unit (Cabinet Office, 2005) appears to recognise the need for a paradigm shift in e-Government thinking – noting that three quarters of government services are available electronically but that beyond this there is a need to set out a robust strategy for the transformation of the delivery of key public services. These views are echoed in the influential Independent Review of Public Sector Efficiency (Gershon, 2005), which recommends that: (a) there is a need for reinforcement of planning and implementation processes to achieve high levels of adoption of e-enable transactional services and (b) there needs to be a stronger focus on the delivery of services.

While e-Government holds a great potential to improve LGA performance, Holden and Fletcher (2001) argue that there are virtually no systematic research results justifying a rapid transition. Indeed there is plethora of literature that suggests the bureaucracies of government will prove resistant to such change. For example, the multi-agency working research project (AMASE) seeks to address the organisational, managerial, regional policy and technical problems and issues involved in delivering joined-up services (McLoughlin *et al*, 2004). The integrated and seamless service to citizens described by Silcock (2001) may prove elusive, although Bannister (2001) does offer the attractive notion that there may be huge latent value locked in these systems if the challenges facing joined-up government can be overcome.

There appears to be recognition at international and national level that the major benefits of e-Government will only be realised when it matures to include deeper and more radical process transformation – moving from a legacy of bureaucratic delivery mechanisms to faster, simpler and more flexible technology-facilitated delivery processes. The transformation it requires involves a deeper understanding of the organisational, human, process-oriented and technical challenges involved in the successful process transformation than has so far been evident.

5.2 Case Organisation One – LGA_A

5.2.1 Background to LGA_A

Due to confidentiality reasons, the researcher uses the name LGA_A, to refer to the first case organisation. LGA_A is one of the largest London boroughs in terms of its geographic area, covers a range of diverse environments. LGA_A receives approximately 1000-2000 citizen queries via telephone, whereas, face-to-face contacts are approximately from 250-500 on daily basis. The queries and face-to-face contacts are measured by the contact centre. LGA_A employs approximately 8000 employees and provides its services through various sectors including social and environmental services, property, housing, education, health etc. The borough's senior officer structure was realigned in 2006 to provide for the statutory posts of children's services director and an adult services director. This realignment also created new directorates to meet local and national priorities, including ones for public realm and sustainable communities. The borough also has key corporate groups which cover cross cutting areas such as performance management, risk, diversity and ICT.

In an attempt to better understand this case organisation, before analysing the case data, the researcher discusses the background of LGA_A IT infrastructure, its limitations in integrating IT infrastructure, motivations to EAI adoption, and the EAI adoption process in LGA_A. Thereafter, the researcher analyses two projects *initially*, the analysis of an EAI demonstration pilot project by integrating LLPG and CRM system, *secondly*, top level electronic Forms (e-Forms) and CRM systems integration project and assesses the proposed EAI adoption factors (Figure 3.2) for each project. Subsequently, discussing on the mapping of EAI adoption factors and prioritising the importance of EAI adoption factors on different adoption lifecycle phases for each case study and finally, summarising the findings obtained from all LGA_A projects. Similar introduction is used to commence the other two case organisations.

5.2.1.1 Background to LGA_A IT Infrastructure

The central government has pushed the local government authorities in the UK to: (a) collaborate with other LGAs, (b) improve information sharing within departments and with other LGAs, (c) provide better coordination of business processes and (d) provide integrated service delivery (Kamal and Themistocleous, 2007; Beynon-Davies, 2005; Lam, 2005). In doing so, LGA_A officials believe that to achieve this, a flexible and integrated IT infrastructure is required to: (a) enable web based transactions, (b) improved service delivery, (c) improve performance management and knowledge and (d) improve the robustness of business processes. Such an IT infrastructure will allow LGA_A to easily adapt to its changing business environment and enhance the delivery of their services.

LGA_A is a big borough and has several service areas (departments). Each service area has its own IT infrastructure. The analysis of all the interviews conducted illustrate that LGA_A consisted of numerous heterogeneous IS that were based on a diversity of platforms, operating systems, data structures and computer languages. Most of these systems were legacy applications that still run today on mainframe environments. Since there was a lack of common IT infrastructure, and a lack of central coordination of IT, the majority of LGA_A departments adopted their own applications to support their business activities. These individual applications were not developed in a coordinated way but instead evolved as a result of the latest technological innovation. This led to incompatible systems with integration problems. LGA_A has attempted to overcome this problem by integrating their systems.

For example, LGA_A implemented ERP systems to overcome their integration problems and automate their business processes. Although ERP systems partially addressed the problems of

LGA_A, nevertheless, they simply provide some degree of solution for the integration problems. 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 has been necessitated with the existing infrastructure causing numerous problems. These problems became an obstacle for LGA_A as they prevented it from implementing its business goals. For instance, LGA_A 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_A back from achieving an integrated IT infrastructure and cost reductions.

After conducting interviews at LGA_A with the Head of ICT (HICT), Senior Development Support Engineer (SDSE), Service Delivery Manager for Applications (SDMA), Head of IT (HIT), Web Manager (WM) and the Project Manager (PM) from two different departments on two different projects (Sections 5.2.2 and 5.2.3), the technological background illustrates that their IT infrastructure has been underdeveloped and not integrated and thus, several limitations existed in their IT infrastructure e.g. the head of the ICT department and others mutually agreed that:

> "... *IT infrastructure within LGA_A was constructed in a departmental way. Each of the major service areas within this borough had their own IT infrastructure* ..."

The non-integrated IT infrastructure at LGA_A before adopting an EAI integration solution as agreed by all the interviewees is shown in Figure 5.1. The illustration depicts that each major service area had their own IT infrastructure and within each service area possessing several non-integrated information systems.

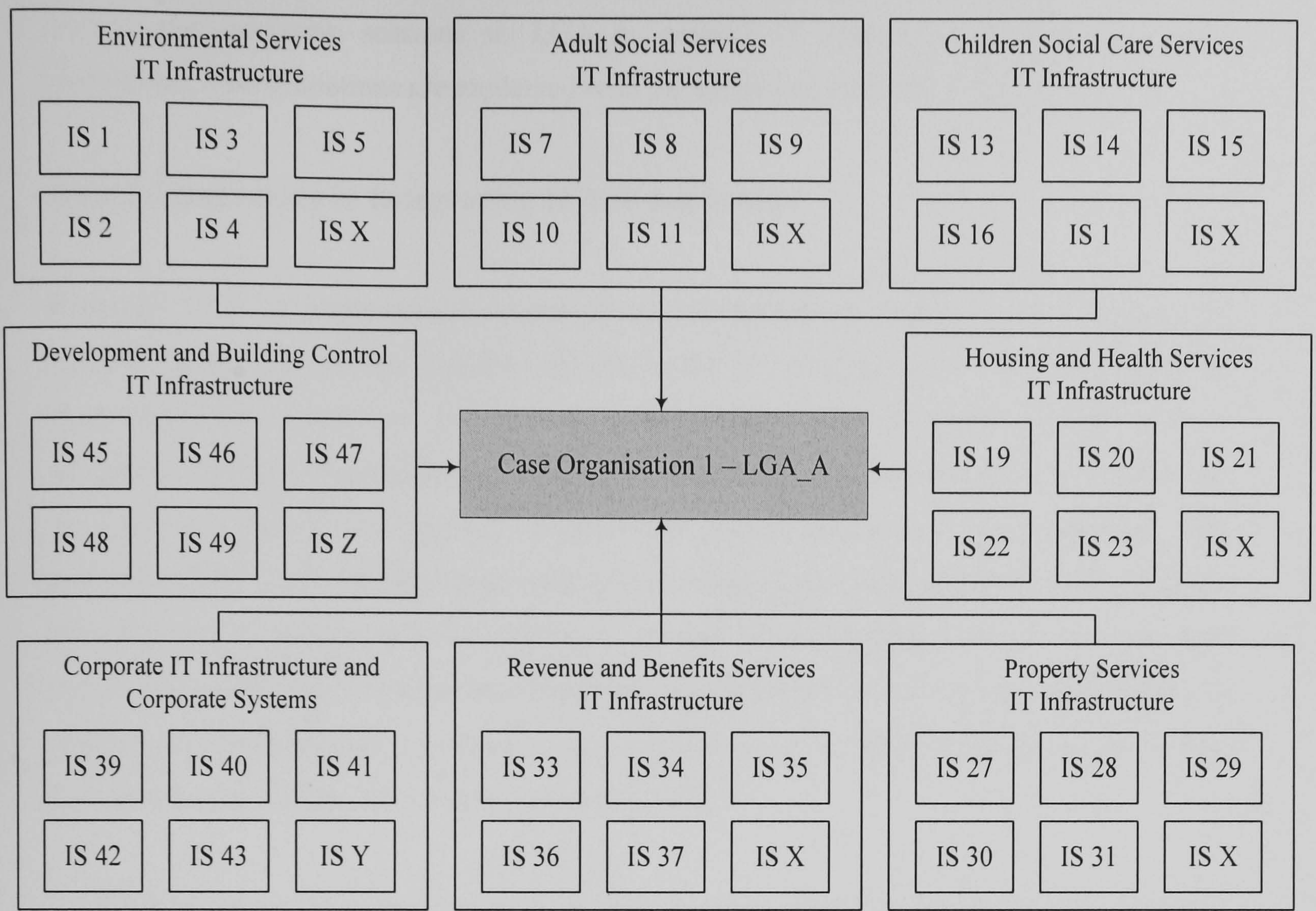

Figure 5.1: LGA_A Non-Integrated IT Infrastructure

LGA_A officials later recognised the need to invest in this area (e.g. integrating their IT infrastructure) in order to deliver its priorities. A technology road map was developed through which investment of £8.5 million was planned to spend on enhancing the security and use of ICT, demonstrating a commitment to the national e-transformation agenda and integrating their IT infrastructure. LGA_A is now committed to partnership working to improve the quality of ICT as shown by its involvement in the London public service network, resulting in leveraging extra capacity and resources from partners to jointly improve services to residents. Examples are the development of the project management toolkit, e-procurement and the agency staff tool. LGA_A also makes some innovative use of ICT in delivering services, for example in using SMS messaging to pursue rent arrears and overdue library books. Staff members that are relocated to newly modernised offices state ICT facilities, including wireless networks are an improvement on those available in outlying offices and have improved efficiency. In support of this, the web manager stated that:

> "... *we are now trying to get to that point where we haven't really been in the past and this was just because of non-integrated IT infrastructure and silo-based mentality among different departments and their staff members* ..."

During the interview sessions at LGA_A, several IT infrastructure limitations were highlighted. The limitations are explained with the comments from the interviewees.

5.2.1.2 Limitations in Integrating IT Infrastructure

Although LGA_A implemented several IS as exemplified in Figure 5.1, to improve its services, these information systems did not solve all problems and thus, preventing in overcoming the limitations of their IT infrastructure. The researcher presents several limitations that were highlighted: (a) during the interviews, (b) from documentation provided by LGA_A officials and (c) self observations during interviews. The limitations that prevented LGA_A in developing an integrated IT infrastructure are presented below and are classified in the same way as in Chapter 2. Similar IT infrastructure limitations were also reported in normative literature and therefore, the categories of limitations reported herein support previous published evidences (e.g. Gil-García *et al.,* 2005; Signore *et al.,* 2005; Gortmaker *et al.,* 2004; Janssen and Cresswell 2005).

- **ERP Systems Failures:** LGA_A IT infrastructure was heterogeneous and consisted several incompatible systems. As a result, LGA_A faced significant integration problems when attempting to migrate their existing custom built applications to other ERP systems. The senior development support engineer reported that:

  "*... there was a real need to make data compatible between one ERP system and the other and making one ERP system compatible with other legacy systems. Many of the systems and data were held entirely in a different way. So one challenge was to take data from one system, reconstruct it in to a format that was common to all other systems ...*"

  In addition, there was redundancy of data and functionality, as many applications store similar data or run systems that overlap in functionality. The head of ICT stated that:

  "*... one of the major problems faced was the technical capability and the integration of our systems with other systems. The reason was that our department always used point-to-point integration to integrate these systems and thus, was unable to share information with other departments ...*"

  Moreover, the service delivery manager for applications also articulated that:

"... *we had problems of data interchange between different packaged and legacy systems ... sometime there was a problem of data compatibility, different data record layouts in all systems and or incompatible platforms. Eventually mapping of data from system to system was a challenge ...* "

Therefore, the evidences provided by different interviewees emphasize that ERP systems did not benefit LGA_A in solving their integration problems.

- **Organisational Information Sharing and IS Integration:** The discussions with the interviewees illustrated that information sharing was a major problem, as the senior development support engineer reported that:

  "... *sharing of information again subject to information security was without doubt one of the major challenges to meet ...*"

  Moreover, the web manager also highlighted that:

  "... *information sharing is still today a major problem, like several other boroughs even our borough perceive themselves as owners of data, and thus are very protective about sharing their data with other agencies and such unwillingness in sharing data has prevented us in integrating our IT infrastructure ...*"

  To address the issue of information sharing, the definition of access rights to data would appear critical to establishing what constitutes legal and legitimate access to data. While discussing on the issue of information sharing with other departments in LGA_A, the head of ICT replied that:

  "... *among almost all the London boroughs and their departments there is a general inability to accept change and share information ...* "

  All the interviewees expressed the need for standardisation in data formats and the adoption of a common data model.

- **Citizen Data Security and Privacy Issues:** As reported in Chapter 2, a critical obstacle in implementing e-Government is the citizens' concern on privacy of their life and security of the personal data they are providing as part of obtaining government services. While discussing on data security and privacy issues, the web manager replied that:

> "... *data protection has been one of the most important problems to meet because citizens' data may contain important information e.g. their name and home addresses and e.g. why do I give this information to other departments. Thus, access to information had to be controlled as disclosure of such information to irrelevant users may cause problems for citizens' privacy. However, in turn this caused us problems in collaborating with other departments and sharing data ...*"

Furthermore, the senior development support engineer also accentuated that:

> "... *it is very clear that now at LGA_A, we have prohibited certain aspects of the council to share data with other councils and between different departments ... because data security in particular areas such as social services and payroll that is indeed clearly a challenge ...*"

It appears from the interviews that similar perceptions exist between the interviewees that whether the selection of EAI solves citizen's data security and privacy issues. The underlying argument by all interviewees was that the success of any integration technology is reliant on the citizen's trust that their data is secure and confidential.

- **Business Process Reengineering in e-Government Projects:** While discussing BPR in e-Government projects, the head of ICT department replied that:

> "... *the biggest challenge LGA_A has in their different e-Government projects is not the integration of the IS itself but the integration of the business processes and people between the departments using the IS ...*"

Other interviewees also presented their views on BPR but their explanation was not directly related to this limitation. The researcher's observation from the interviews conducted is that LGA_A could not support their goals of closer collaboration and coordination of inter-organisational business processes with other departments and this was mainly due to the non-integrated nature of their IT infrastructure. The researcher also observed during the discussions that if LGA_A IT infrastructures do not efficiently support core business processes then this may be an obstacle in achieving their business goals. Therefore, it is necessary for LGA_A to fully reengineer their business processes so as to take advantage of EAI technology.

- **Front-Office/Back-Office Operations and Functioning:** Legacy systems within LGA_A have restricted the development towards citizen-oriented processes. As a result, LGA_A needed an integration solution that would assist in enabling seamless communication between front office and back-office legacy systems and applications. This problem is sometimes further exaggerated by different IT suppliers. For example, the head of the ICT stated that:

  "... *from IT supplier's point of view, IT suppliers tend not to support integration unless we are using their systems to integrate with each other* ..."

  Discussion with the head of ICT also revealed that the IT suppliers would only integrate LGA_A systems with other non related supplier products with their integration solution if they were benefiting from them, otherwise they would not support the integration process.

- **Financial Issues in Implementing Integrated e-Government:** LGA_A believes that it is not cost effective to support a large infrastructure, which includes numerous systems with overlapping functionality. The maintenance cost of such an infrastructure is also high, which presents an additional financial problem. Discussing on this issue the head of the ICT department reported that:

  "... *LGA_A attempted to adopt several cost effective solutions to overcome this situation with one of the solutions that were proposed focusing on point-to-point interconnectivity for their legacy systems* ..."

  The head of the ICT department furthermore added that

  "... *it is sometimes easier to integrate the processes without integrating the systems. So when you talk about EAI, then sometimes it is actually more effective not to integrate the systems but to integrate people and keep the systems diverse, as we cannot justify the cost* ..."

  On the other hand, LGA_A's community citizens demand better service delivery from them. However, the insufficient IT infrastructure could not accomplish this aim due to point-to-point interconnectivity. This situation resulted in a lack of trust between

LGA_A and the citizens. Moreover, the senior development support engineer also added on this issue that:

> "... *because we had systems that were not our software supplier based and the manufactures were very reluctant to build adapters that converted the data for our several non- software supplier systems, large costs were pulled out* ..."

Clearly, the findings on the background to LGA_A IT infrastructure indicate that there was a negative impact on the delivery of services to citizens. All the limitations are summarised in Table 5.1.

Integration Drivers	LGA_A IT Infrastructure Limitations
ERP Systems Failures	• Data interchanging and compatibility issues. • Issues of packaged systems incompatibility with legacy systems. • System platform incompatibility. • Mapping data from system to the other.
Organisational Information Sharing and IS Integration	• Sharing of information subject to security with other departments. • Very protective about sharing data with other agencies.
Citizen Data Security and Privacy Issues	• Data Sharing. • Security of data.
BPR in e-Government Projects	• Integrating business processes. • Intransigence between the departments.
Front-Office/Back-Office Operations and Functioning	• IT suppliers do not integrate systems e.g. X supplier will not integrate with Y supplier products.
Financial Issues in Implementing Integrated e-Government	• Cost of maintaining point-to-point legacy integration. • Difficulty in justifying the cost. • Manufacturers reluctant to develop adapters for legacy systems integration, thus large cost of money pulled out.
Supporting Management and Decision Making Process	–

Table 5.1: LGA_A – IT Infrastructure Limitations

It appears from the discussions during the interview sessions that the limitations of IT infrastructures explained in Section 2.2.1 are verified since similar views were shared by the interviewees. However, these IT infrastructure limitations within the two departments in LGA_A motivated their departmental officials to take the decision for EAI adoption for developing integrated IT infrastructure.

5.2.1.3 Motivations for EAI Adoption

The limitations of IT infrastructures led LGA_A departments to take a decision to significantly advance in their service delivery by adopting EAI technological solution to develop an integrated IT infrastructure. This decision has been widely supported by the UK central government, as it is in accordance with the practices of the UK e-Government modernisation agenda i.e. to modernise the LGAs (Beynon-Davis and Williams, 2003). The analysis of relevant documents related to LGA_A e.g. the Corporate Assessment (CA)[3] report 2007 and the Implementing Electronic Government (IEG)[4] report 2006, indicate that LGA_A had immense pressure from the central government. This pressure can be signified as external pressure i.e. direct influence from the central government for providing integrated service delivery and for this purpose along other local government authorities, LGA_A was also given a £ million by the central government.

To this end, it appears that the problems with IT infrastructure in LGA_A and the central government influence formed a kind of external and internal pressures. External pressures appear to deal with citizens and other government agencies and councils where internal pressures focus on factors such as managerial and technical issues. The head of ICT also supported that internal and external pressures are highly important for EAI adoption. For example for external pressure the head of ICT said that:

> *"... there is a direct influence from the central government in some areas for integration and there is some legislation that requires us to develop integrated IT infrastructures... and the other major external pressure is the residents and other councils i.e. we feel a direct pressure from them to improve our services ... "*

For internal pressure the head of ICT stated that:

> *"... the relationship between the operational needs of delivering the service versus improving the service delivery e.g. do I improve the social services business processes and systems or you quite simply buy more extra beds ..."*

These finding validate the normative literature that support the (a) IT infrastructure, (b) internal and (c) external pressures as factors that influence the decision making process for EAI adoption (Themistocleous, 2004).

LGA_A initiated a plan for developing a pilot project. The motivation behind this pilot project was to address the limitations of its existing systems, and to meet the targets set by the central government. The decision for this pilot project was made by the managing board after

3 – CA assesses how well a local authority engages with and leads its communities, delivers community priorities in partnership with others and ensures continuous improvement in services.
4 – IEG is formal report to the central government and is part of the e-Government strategy adoption in the United Kingdom

discussing this issue with their project manager and other senior managers involved. The objective of this pilot project was to demonstrate to LGA_A and to other London boroughs that investing in a long-term programme of integration between packaged systems and legacy applications is necessary. On this basis the adoption of such integration architecture within LGA_A and other London boroughs will deliver measurable business benefit.

The analysis of the interviews illustrates that members involved in this projects had their rational motivations behind supporting the decision for EAI adoption. For example, the head of ICT reported that:

> "... *we had to improve our service delivery, reduce our costs and improve our performance management and knowledge. Other reasons were that EAI supports in developing flexible working environments e.g. you can integrate systems in more flexible ways. In addition, EAI also assists in access and sharing of information. Lastly, it had been imposed on us by the central government to implement integrated service delivery, so we decided to invest in EAI* ..."

While discussing on the motivations to EAI adoption with the service delivery manager for applications, web manager and the project manager, they mutually agreed that:

> "... *the intention for supporting for EAI adoption decision was that EAI would enable web based transactions and in addition, would also facilitate an increase in the volume of web based transactions. Moreover, EAI will improve the robustness of our business processes. In this way we may be able to better analyse our business processes and perform efficiently. In turn EAI would assist in cost savings and save time* ..."

In interpreting the discussions during the interview, it appears that internal as well as external pressures influence the decision making process for EAI adoption at LGA_A. Another factor that appears to influence the adoption of enterprise application integration is related to the organisational IT capability i.e. limitations in IT infrastructure at LGA_A.

5.2.1.4 EAI Adoption Process

LGA_A has plethora of legacy systems. Despite these systems were efficient in supporting some departmental functions, were not integrated. Thus, LGA_A was faced with the option of withdrawing these systems away and start developing integrated systems again, or finding a method of migrating to a new generation of systems, which would support integration. Due to the rich source of information contained in them and to make development more manageable, the second option was chosen. LGA_A believes that it is a big challenge to bring together all information systems and fully automate the borough. Hence, in 2004 LGA_A's corporate IT department started examining available solutions to meet the challenge for developing a standardised, flexible, integrated and homogeneous IT infrastructure. After reviewing these solutions, LGA_A took the decision to introduce ERP systems to solve their integration problems and provide better services. Also, LGA_A was aiming at integrating its business processes through an ERP solution. However, soon thereafter LGA_A realised that ERP systems cannot communicate with other packaged systems and have limitations, as they cannot exchange information with other vendor applications.

The insufficient nature of their IT infrastructure and the need for integration led LGA_A to revisit their strategies for developing integrated IT infrastructure. Thus, the top management formed an ambitious vision aiming at: (a) enabling integration internally and externally; (b) achieving effective and efficient joined up government and (c) enabling electronic request and delivery of services. As a result, supporting the decision making process for EAI adoption. LGA_A did not take the decision to fully integrate the borough since such a solution had a high cost. The project manager reported that the plan for developing an integrated IT infrastructure on a large scale was considered of high risk for the following reasons: (a) there is no single application integration technology or software package that supports the development of an integrated IT infrastructure on a large scale and (b) there is a lack of knowledge in LGA_A regarding incorporating applications based on EAI solutions. This indicates that barriers like the lack of knowledge of EAI and the lack of a single EAI product that solves all integration problems, influenced LGA_A's decisions regarding EAI adoption. In support of the whole process for EAI adoption, the head of ICT department reported that:

> "*... when we talk about EAI, everybody suddenly thinks that all systems have to communicate to all other systems ... but we cannot do that because it not a good idea. The reason is that if you only have 100 requests a year then you can use the manual way rather than spending £50000 a year on integrating the whole department ...*"

As the plans for integrating LGA_A were not completely justified, its top management suggested a demonstrator to be run and to evaluate the outcome. Other reasons to run a pilot project was the high costs of, and the limited successful cases of, EAI application in the public domain and act as an exemplar for other departments to work on EAI. The pilot demonstrates that the integration: (a) is technically feasible, (b) can deliver significant benefits to LGA_A and (c) may assist the LGA_A in extracting relevant EAI barriers and risks. Such a decision is supported by the literature (Themistocleous and Irani, 2002; Puschmann and Alt, 2001). LGA_A hoped that then central government would recognise the success and importance of the project and award it 'National Project' status. Such funding would be very important in supporting the ongoing roll-out of the integration across LGA_A and beyond the scope of the demonstrator.

As the decision was taken to adopt EAI solution for the pilot project and for other projects in future, the interviewees was asked to comment on whether what factors negatively and positively affected the EAI adoption process. The head of ICT and the service delivery manager for applications replied that:

> " ... *there were several negative factors that affected our EAI adoption process for example the most important problem was the silo mentality among our older staff members that resisted to such a change in the department ... this was also because there were insufficient technical skills and expertise to do integration and our staff lacked understanding of business integration – for this reason we had to invest a lot of money to train our staff to build their skills on integration ... because the funding from central government was a constraint, the cost of technology and money to spend on training the staff added to the problem* ..."

The service delivery manager for applications also added that:

> "... *the support from vendor on EAI was weak and also said that the product was an unusable piece of technology* ..."

However, the head of ICT further reported on the positive factors that:

> " ... *despite there were some problems but when we integrated our systems through EAI, the systems physically got better and everybody saw that the working conditions and our resources are improving i.e. performance as well as the systems improved. As a consequence of doing this the moral of the staff improved and communication and information sharing was enhanced* ..."

The aforesaid views on the EAI adoption process illustrate that LGA_A faced several benefits and barriers while adopting EAI. The investment in integration and weak support from the vendor were other negative factors, thus, validating four factors (i.e. barriers, benefits, cost and vendor IT support) that influenced their decision to adopt EAI. In the next section, the researcher discusses on the EAI demonstration pilot project undertaken at the Corporate Information and Communication Technologies Department (CICTD) at LGA_A.

5.2.2 EAI Adoption in CICTD – EAI Demonstration Pilot Project (EAI-DPP)

The aim of the pilot project was to prove that EAI could be used for the development of a standardised, flexible and maintainable IT infrastructure that integrates both intra and inter-organisational business processes and applications. For this reason, the pilot project attempted to test whether EAI supports a robust IT infrastructure that achieves: (a) closer collaboration with other departments, (b) improves information sharing, (c) better coordination of business processes and (d) integrated service delivery. Another target of the pilot project was to demonstrate possible outcome of EAI. In doing so, it would help LGA_A CICTD and managing board justifying the adoption of an EAI solution.

- **Selection Process:** During the last 3-4 years, LGA_A CICTD collaborated with Softcom (a software vendor) to introduce a CRM solution that was incorporated with modules like complaints, street care, housing benefits and council tax. All these packages provided by Softcom have improved the citizens' satisfaction, the efficiency and performance of CICTD, and speeded up business processes. Nonetheless, there was a lot of scepticism regarding the integration of Softcom applications with non-Softcom systems within CICTD. The CRM solutions earlier adopted could communicate with other ERP packages but had limitations, as they could not exchange information with non-Softcom applications.

  The insufficient nature of the then existing IT infrastructure and the need for integration led CICTD to revisit its e-Government, citizen services and investment strategy. One solution was to phase out the non-Softcom applications and replace them with new ones. However, such a solution would have had cost millions of pounds to CICTD. There was less time and money and no proper justification to do so (e.g. eliminating the functionality of reliable systems). Also, the risks associated with such an approach were high. Conversely, CICTD was seeking possible solutions through integration. The IT management was persuaded that integration could deliver measurable business benefits to CICTD that are worth the costs.

CICTD relied on Softcom technical expertise to develop and integrate their IT infrastructure. Softcom is a large multinational company that provides integration solutions for the LGAs looking to integrate various applications and IS from different departments (e.g. housing, education). CICTD followed a proactive approach when adopting IT solutions and aimed to be amongst the first LGAs (in the UK) that will integrate their IT infrastructure. For that reason, CICTD took the decision to integrate its CRM and LLPG systems with the other back office systems using EAI. Since the Softcom provides EAI solutions, CICTD decided to collaborate and integrate its systems.

In doing so, CICTD bought EAI software from Softcom without evaluating other alternative EAI packages. Such a decision differs from the practices of other organisations that evaluate EAI software before selecting one. When the head of ICT was asked for the reasons that led their organisation to this action reported that:

> "*... in LGA_A CICTD there is lack of knowledge and expertise on EAI and the trust and close collaboration between CICTD and Softcom which led the organisation to follow the suggestions of Softcom ...*"

Conversely, the Softcom provides a solution, which is a mixture of some EAI technologies put together to promote the sales of their solution within various other LGAs. The Softcom has strategically invested in this project, as EAI is a new market in public domain. Softcom, by designing and customising a solution for one LGA, can package this solution and easily sell it to other LGAs. Thus, it can easily gain a competitive advantage and market leadership.

- **Integration Approach:** Initially CICTD decided to integrate few business processes and IS including: (a) housing and (b) LLPG. This approach demonstrated that CICTD does not follow a strategic adoption of EAI but an opportunistic one and seeks to overcome point problems to improve key business processes. Different issues were highlighted during the interview sessions, for example: (a) CICTD interviewees followed the suggestions of Softcom, as there was a lack of EAI knowledge and skills in CICTD. Softcom influenced them that this is the easiest way to develop an integrated IT infrastructure, (b) CICTD interviewees mentioned that this is the best way to implement a small-integrated IT infrastructure. Based on the evaluation of this small demonstration pilot project they could expand the project (e.g. including other business processes) in the future, (c) CICTD interviewees suggested that there is no need to integrate all business processes but only a subset of them. From the discussions, it appeared that there is lack of understanding the benefits of an integrated IT infrastructure within CICTD, (d) CICTD interviewees believed that this solution will result in an exemplar integrated IT infrastructure in an LGA (UK) and there is therefore no need to integrate all the processes and (e) CICTD interviewees seem to be sceptical about risk and cost of such integrated solution. Since this was the first attempt to piece together LLPG, CRM system and other back office systems in the UK, CICTD wanted to eliminate the cost of a possible failure.

- **EAI Demonstration Pilot Project:** The EAI-DPP is a project within the CICTD where an integrated solution was developed to provide multi-LGA access and sharing of information. Several other local authorities own and manage their own applications and databases. Local authorities are not aware of the information held on a specific citizen within another local authority. The EAI-DPP is based on integrating multi-local authority to enable the local authorities involved with monitoring citizens to share information, track and monitor records of all citizen queries and take action when required. The problem is lack of communication between the local authorities, which could have resolved citizen problems. The need to integrate these systems is raised to avoid similar mistakes from the past reoccurring. The aim of EAI-DPP project is to demonstrate CICTD officials and other LGAs that investing in a long-term programme of integration between Softcom solutions and non-Softcom solutions is necessary. On this basis the adoption of integration architecture within and among other local authorities will deliver measurable business benefits.

Figure 5.2 illustrates that CICTD was working towards a 'hub and spoke' architecture. The 'hub' is a single Softcom database from which applications (the 'spokes') draw data and to which they return data. The integration between LLPG and CRM system via Softcom hub i.e. (Softcom InterConnect Integration hub) will enable a two-way flow of data between LLPG and CRM system via hub. For example, citizens will be able to request changes to addresses through the CRM system that will then update LLPG; and changes from other sources to LLPG will update the property elements of the CRM system.

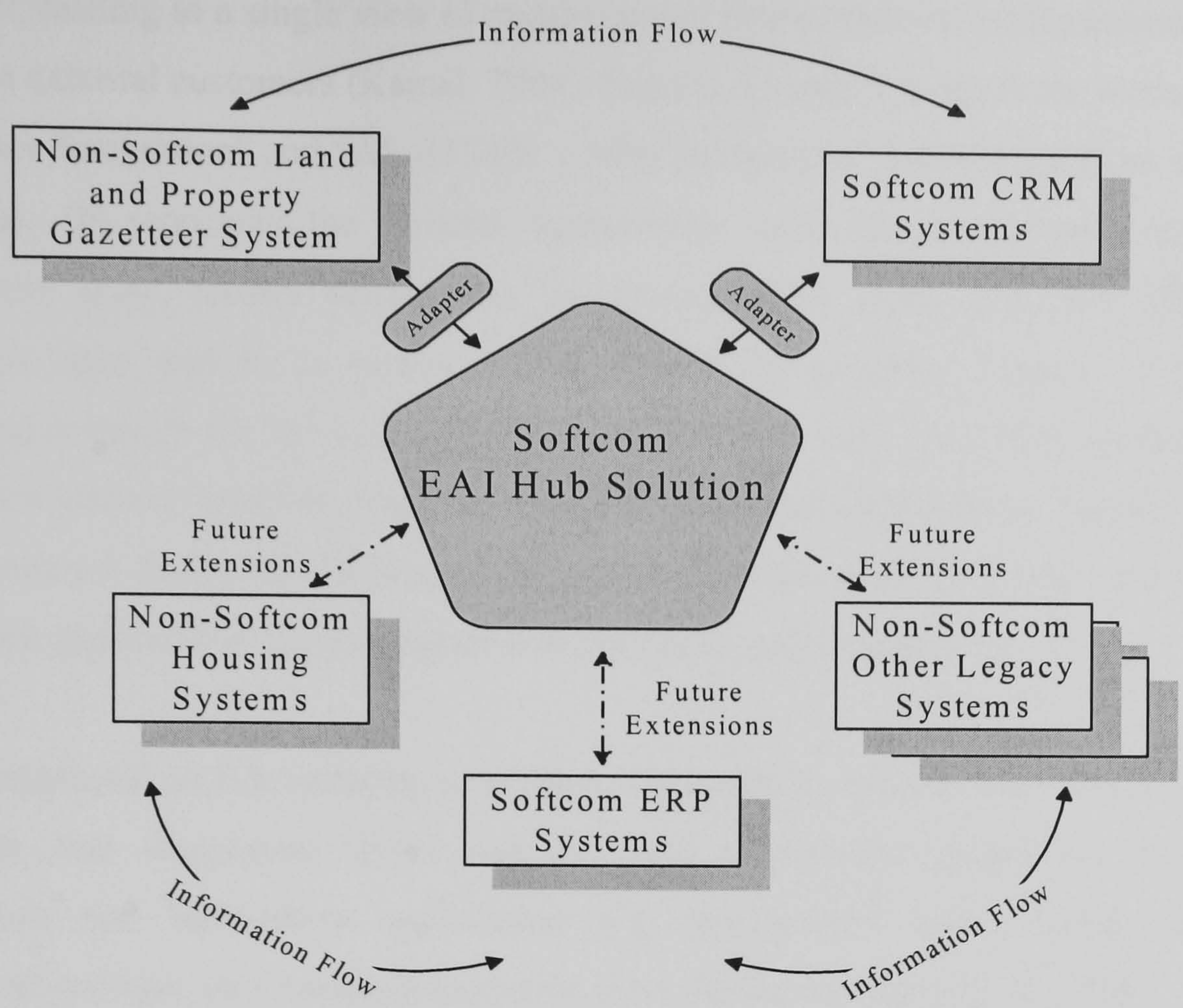

Figure 5.2: EAI Demonstration Pilot Project

- **The Solution:** The need for integration is to provide a common view of information from all the systems. There are different contacts telephone numbers for each LGA and e.g. if a citizen wants to contact social services as well as the benefits department by telephone, a call is either transferred to the benefits department or the citizen has to call the benefits department specific line. This makes call handling difficult, slow and lowers the number of calls answered to offer services to the citizens. CICTD planned that by using CRM system as the front office linked to the existing back office applications, a common view of information held in all back office applications could be achieved. In addition, using the call centre facilities of CRM system, a single call answered from a citizen can solve queries regarding various sectors, handled by one agent. This will enhance quick, efficient provision of services, a higher number of calls will be handled and the long list of numbers (one for each sector) is reduced to 'single point of contact'. Citizen contact via mail or email also needs to be directed to the required sector currently, using CRM system there is a variety of communication channels, which can be used, and all information processed from the CRM system.

However, as reported earlier just by using CRM system is not enough, as it still needs to communicate with other applications at the back-office. To communicate with other applications there is need to integrate CRM system with the back-office applications. The reason is that CRM is another type of ERP system that need integration with the other points of contact, leading to a single view of multi-channel interactions including internal personnel as well as external customers (Kamal, 2004). Figures 5.3 and 5.4 depict the scenarios of "AS IS – Before Integration" and "AS AFTER – After Integration" information flow. In Figures 3 and 4, (a)…(b) represents the message transmission steps, the dotted boxes represents the connectivity layer, arrows demonstrate the transportation layer, 123…abc illustrates the translation layer and b…n represents the number of adapters. Figure 5.3 focuses on developing a design for the process of information flow from the CRM application to the back-office without applying integration technologies and architectures. Figure 5.4 focuses on developing a design for the process of information flow from the CRM application to the back-office applications using integration technologies and architecture.

CICTD employed an EAI solution to integrate back-office with the front office applications. There are four integration layers that are used to provide integration between CRM applications and back-office applications e.g. connectivity layer, transportation layer, transformation layer, and process automation layer (Themistocleous *et al.,* 2006).

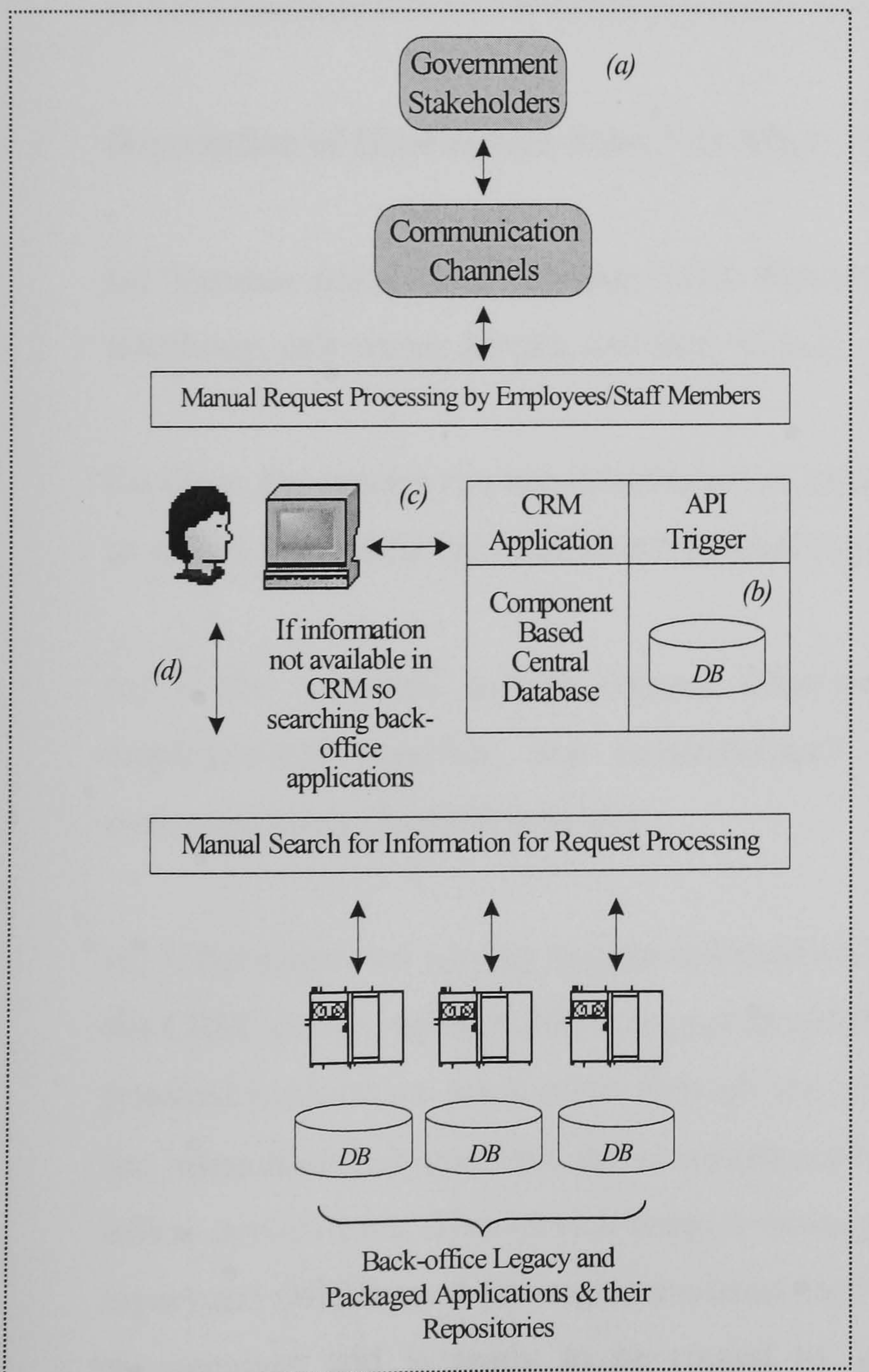

Figure 5.3: Information Flow "Before" Integration

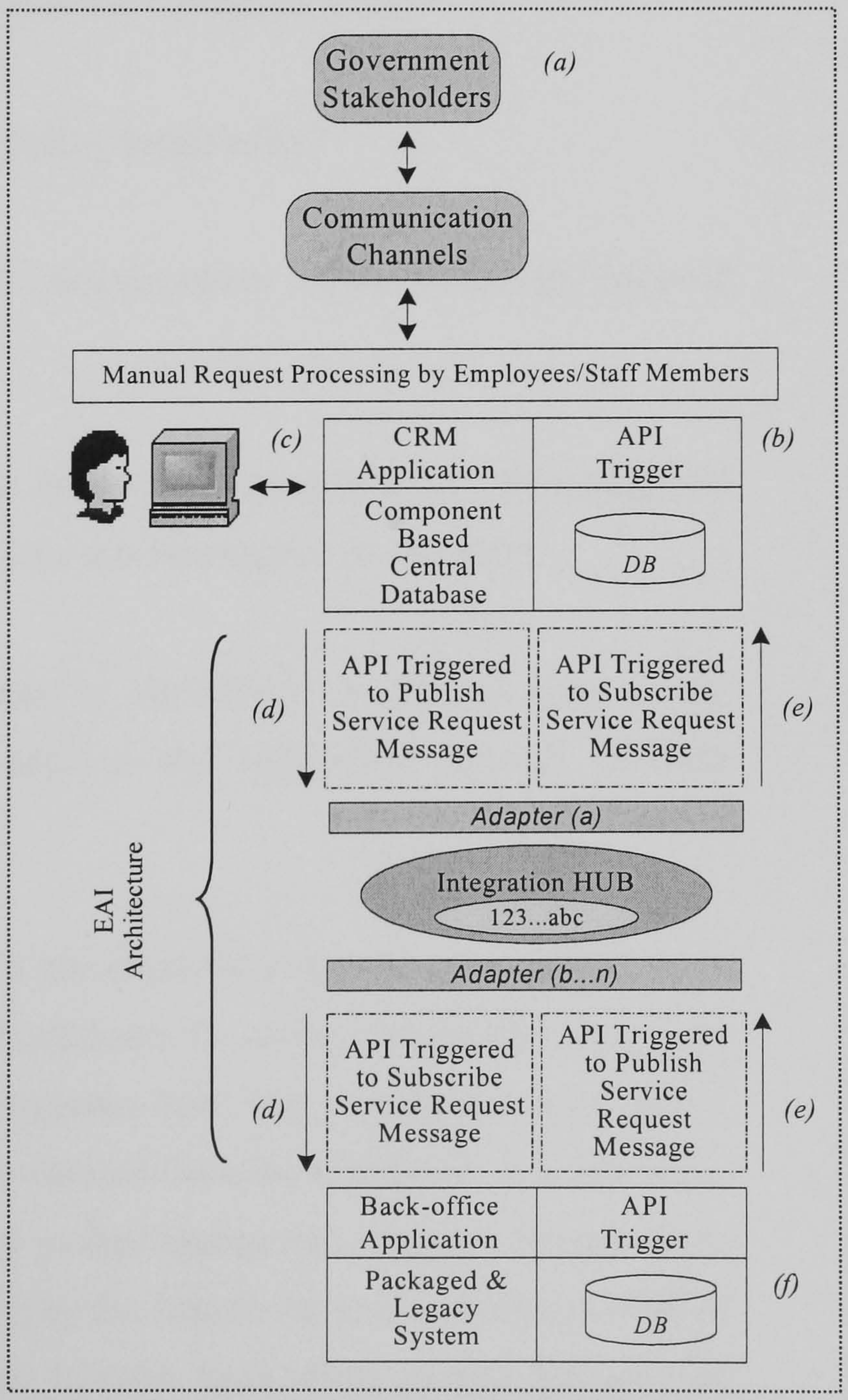

Figure 5.4: Information Flow "After" Integration

Description of Information Flow "As Is – Before Integration"

(a) Various stakeholders contact CICTD through different communication channels (channels such as Softcom's interaction channel components of CRM system) through Internet, telephony, call centre, kiosks, and face-to-face.

(b) Once the service request information is input in the CRM component an API is triggered to search the central database (central repository) for the information as requested.

(c) If the requested service request information is available it is relayed back to the employee/staff member, and communicated back to the stakeholder through different communication channels available.

(d) If the requested service request information is not available within the central database in the CRM system, the information is then manually searched from the back-office systems/applications by the employees/staff member then follow Step (c).

Description of Information Flow "As After – Before Integration"

(a) Various stakeholders contact LGA through communication channels through Internet, telephony, call centre, kiosks, and face-to-face.

(b) Once the service request information is input in the CRM component an API is triggered to search the central database (central repository) for this information as requested.

(c) If the requested service request information is available it is relayed back to the employee/staff member, and communicated back to the stakeholder through different communication channels available.

(d) If the requested service request information is not available within the central database in the CRM system, another API is triggered which publishes the service request message to the required back-office application through the integration hub. The connectivity layer within the integration hub provides the communication channel from the CRM system to the back-office applications. The service request message is then transported (through transportation layer) and transformed (through translation layer) by the adapter (a) to the required format of the receiver and is ready to be routed to the relevant back-office system through the integration hub. Adapter (b...n) then picks the service request message and sends it to the relevant back-office application, which subscribes the service request message. Depending on the type of back-office application, the adapter is selected from (b...n).

(e) Within the back-office application, another API is triggered to search for the requested service request information. When information found, it is published by the back-office application. Adapter (b...n) picks it up, transforms (through translation layer) it to the required format for the CRM system, through the hub and adapter (a) picks it up and transports (through the transportation layer) to the CRM system, which subscribes to the message. Then follow the Step (c).

5.2.2.1 Findings on the EAI Demonstration Pilot Project

The main issues derived from the EAI demonstration pilot project reported earlier are presented below along with the interviewees' comments:

- **EAI Selection Process:** The selection of EAI software is a complex and important process during an EAI project. As there is a marketplace confusion regarding EAI packages and solutions, many organisations spend time and resources to assess and choose appropriate EAI software. In this case, although the head of ICT championed this pilot project but they did not use any evaluation framework or other tools to assess EAI packages. The senior development support engineer supported this and said that:

  "*... selection of technology has not always been done very well and it's been ad hoc look at the system often by the people that do not have sufficient technological skills and no techniques applied to evaluate the technology ...*"

  The reason for this decision was that within CICTD; there were no clear procedures, norms and formal processes for selecting and assessing EAI software and thus ended in taking the decision to select EAI software without assessing by relying on Softcom expertise. This decision illustrates two significant issues, the manager's lack of market knowledge on EAI area and thus taking the decision to fully rely on Softcom for the selection of EAI packages (market knowledge indirectly influenced the decision to EAI solution). This illustrates that CICTD adopted EAI software without knowing its risks (e.g. its flexibility, compatibility etc) and whether this EAI software provided data security and privacy (Appendix C provides a detailed analysis of EAI technological risks). As the literature indicates that the decision-making for technology adoption is typically centralised at top management level in public sector (Themistocleous *et al.*, 2005; Ebrahim *et al.*, 2004), hence, this decision was of high risk as the CICTD top management chose an EAI package that was under development. The risky decision was that CICTD fully relied on Softcom with experience on IT projects but with no clear view regarding the integration of its packages. Although, in this case study EAI-DPP was successful, the decision for selecting EAI software could have been the other way round.

- **EAI Adoption:** As aforesaid the researcher discussed on six factors namely: (a) formalisation, (b) centralisation, (c) managerial capability, (d) evaluation framework, (e) market knowledge, (f) EAI technology risks, (g) project champion and (h) personnel IT knowledge. The aforesaid arguments on these factors represent that these factors have influenced EAI adoption in CICTD except formalisation and evaluation framework because there were no formal procedures followed and no assessment method was used while adopting EAI respectively. In addition, to these factors, the researcher presented several other factors in Sections 3.1.1 and 3.1.2 that have also influenced the decision making process for EAI adoption in LGAs. All the factors were validated through this case study. For example, as exemplified from the case study there was IT support from Softcom. Softcom consultants and integrators supported CICTD to introduce EAI in LGA_A. In doing so, supported and influenced the decision-making process. Moreover, IT support from Softcom also improved IT sophistication and enhanced the organisations' and staffs personal knowledge regarding applications integration and EAI. The CICTD top management and HAA initially recommended and supported to work on the EAI-DPP and evaluate the outcome. The head of ICT and the senior development support engineer mutually reported top management and HAA as very important factors for EAI adoption at CICTD. They said that:

> "... *yes certainly both the factors are very important because there is a direct influence coming from the top management within LGA_A and the HAA to improve services and peer pressure for sharing of data* ..."

The reasons to run the EAI-DPP project were the high costs of maintaining the non-integrated legacy systems, the limited successful cases of EAI application in the public domain and a pilot integration project would be technically feasible. The decision makers also expected that by implementing a pilot project, it would benefit in building up their knowledge and understanding on EAI area. Furthermore, while implementing a major project EAI, the experiences of the pilot project would assist them in realising significant ROI and dealing with citizens' data security and privacy. The EAI-DPP project demonstrates that the integration: (a) is technically feasible and (b) can deliver significant benefits to CICTD. The service delivery manager supported and said that:

> "... *because sometimes we have a lots of work to, we do pilot projects and take this pilot project as a method to develop other big projects at CICITD* ..."

As reported in Section 3.1.2 that size can be categorised as the size of the community served and organisational size. CICTD seems to be a large organisation and serves a large community within a specific region of the UK. In doing so, CICTD decided to run an EAI-DPP. The reasons were:

- An improved understanding of how to undertake subsequent integration, supported by the tools and outputs developed as part of the pilot project.

- A demonstration to other London boroughs that they do similar integration depending on their organisational and community size.

- A much better understanding of how to deliver integration.

- A better relationship with vendors (in this case Softcom) to support the chances of technical support in future.

- Develop expertise of working with to date integration technologies among the staff.

- Use the project as a lever for attracting additional funding for other similar projects.

Benefits extracted from the EAI-DPP project including among others were: (a) reusability of systems, components and data, (b) reduction in data redundancy, (c) reliable data, (d) support in data sharing, (e) collaboration among departments, and (f) improved management and supports decision-making. Detailed analyses of other benefits extracted by observation and discussions during the EAI-DPP project are presented in Appendix C. As reported earlier the adoption of EAI has its own barriers. In the case of this department (CICTD), *barriers* extracted are: (a) reliance on Softcom for expertise, (b) no evaluation frameworks used to assess EAI tools, (c) lack of EAI knowledge, (d) low level of CICTD IT infrastructure and (e) lack of business process reengineering. Detailed analyses of other barriers extracted by observation and discussions during the EAI-DPP project are presented in Appendix C.

- **Integration Approach:** The researcher suggests that the low level of IT infrastructure in CICTD influenced the integration solution. The case data reveals that CICTD was persuaded by the Softcom to implement an integration solution. Another issue related to this decision is the poor analysis and design done during the project. But, this is again an issue related to the low level of IT infrastructure. It is related to the absence of a specific software methodology that explains the main steps in designing and implementing integrating system in which existing and new applications are bridged together.

- **Project Implementation:** One of the biggest problems with CICTD in EAI-DPP was the lack of knowledge on integrating applications using EAI technology and the ignorance of issues related to integration (e.g. BPR). The development team did not carry out a BPR before the implementation of EAI-DPP. For example developers developed some functionality, uncovered lack of flow and mismatch of processes and then redesigned the processes and thereafter implemented the functionality again. This is an implementation paradox as other case studies on EAI report that the design and reengineer phase takes place in the beginning of an EAI project and take up to 60-70% of the overall time (Themistocleous, 2004). The researcher suggests that there is a need to analyse and understand all the systems in question rather than rushing to install new systems and facing more problems with the existing one.

5.2.2.2 LGA_A CICTD – Analysing the Issues under Research

The aforementioned views on EAI-DPP carried out in CICTD, further support the aim of this research and demonstrate that there is scope for timeliness and novel research in this area. To test the conceptual model for EAI adoption in LGAs (presented in Figure 3.7), the researcher follows the research issues as summarised in Table 5.2 and analyses these research issues in the following sections.

Research Issues	Description of Research Issues
Research Issue 1: (Section 3.1.3)	• Testing Research Issue 1: Factors Influencing EAI Adoption in LGAs
Research Issue 2: (Section 3.2)	• Testing Research Issue 2: Adoption Lifecycle Phases
Research Issue 3: (Section 3.2.1)	• Testing Research Issue 3: Mapping EAI Adoption Factors on Adoption Lifecycle Phases
Research Issue 4: (Section 3.3.1)	• Testing Research Issue 4: Prioritising the Importance of EAI Adoption Factors on Adoption Lifecycle Phases

Table 5.2: Empirical Investigation of the Research Issues

5.2.2.2.1 Testing Research Issue 1: Factors Influencing EAI Adoption in LGAs

The interviewees were asked to comment on the importance and the involvement of EAI adoption factors in the EAI-DPP. Table 5.3 provides with the analysis of the factors based on the views from the interviewees using Miles and Huberman (1994) scale of less important (○), medium important (⦿) and most important (●) and where the interviewees did not respond, the researcher uses "×" symbol to illustrate as no response.

	Factors Influencing EAI Adoption	HICT	SDSE	SDMA
PF	Project Champion	●	●	●
	Citizen's Satisfaction	●	●	○
	Critical Mass	⦿	●	●
	Market knowledge	⦿	⦿	●
TF	Evaluation Frameworks	⦿	○	×
	Technological Risks	⦿	●	●
	IT Infrastructure	●	●	○
	Personnel IT Knowledge	●	●	⦿
	IT Sophistication	⦿	⦿	⦿
	Data Security and Privacy	●	●	●
SF	Top Management Support	●	●	●
	IT Support	⦿	●	⦿
	Higher Administrative Authority	●	⦿	●
FF	Return on Investment	●	●	●
	Cost	⦿	●	●
OF	Centralisation	⦿	●	●
	Managerial Capability	●	●	●
	Barriers	●	●	●
	Benefits	●	●	⦿
	Formalisation	⦿	○	○
	Size	⦿	⦿	●

Table 5.3: Validation of the Factors Influencing EAI Adoption in CICTD

The results depict that most of the factors have high importance while taking decisions for EAI adoption. Thus, with the conformity of several factors as highly important, the researcher asserts that although the proposed factors (Figure 3.2) is validated through the EAI-DPP and fulfilling the *second objective* (Section 1.3) of this thesis. However, the extracted results presented in Table 5.3 may not seem sufficient as they are just based on the understanding of the three interviewees. In the following sections, the researcher presents a detailed analysis on the importance of each EAI adoption factor over other factors.

5.2.2.2.2 Testing Research Issue 2: Adoption Lifecycle Phases

As reported in Chapter 3 that technology adoption process involves a sequence of phases a potential organisation passes through before adopting a technology in the organisation. In doing so, the researcher proposed four phases of technology adoption lifecycle in Figure 3.3 namely: (a) motivation, (b) conception, (c) proposal and (d) adoption decision. The interviewees were asked to comment and illustrate the importance of these phases based on the EAI-DPP. Initially, all the interviewees agreed that these phases are very important. For example the senior development support engineer reported that:

> "... *yes these phases are very important with a perfect breakdown and we faced these phases in EAI-DPP* ..."

Whereas, the head of ICT reported that:

> "... *the proposal and adoption decision phases are vital and are the physical aspects whereas motivation and conception are not necessarily physical aspects unless you got a fairly refined strategic approach to what you want to do* ..."

However, the head of ICT, the senior development support engineer and the service delivery manager also reported new phases each. For example, the service delivery manager stated that before the motivation phase, they also faced another phase – external driver phase in the EAI-DDP. He added that as in the external driver phase, CICTD was driven by some external influences e.g. the pressure from the central government, peer pressure and other stakeholder's influence to improve the service delivery. Due to such external influences, CICTD was motivated to run an EAI pilot project. In addition, the senior development support engineer and the head of ICT stated that they faced another phase before the proposal phase such as the discussion phase and the research phase respectively. After discussing on these phases with the interviewees, it appears that both have the same underlying meaning i.e.

> "... *somewhere before adoption decision phase we may have research phase – by research this we mean that we do some sort of discussions to run a pilot case study and this could be before the proposal phase. The reason to bring this phase before proposal is that if we need resources that actually enable us to do the pilot study, then we might need to take the decision to get the money to do it* ..."

After analysing all the interviews, the researcher noted that external driver phase can be 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 or research phase may also be the same as proposal phase. The rationale is that in proposal phase e.g. the departments making decisions to adopt technology need to some sort of research and provide substantiated reasons for approval from the organisation based on the research, besides this the departments need to analyse their requirements and assess their capabilities for acquiring a technology. Thereafter, the interviewees were asked to illustrate the importance of the technology adoption lifecycle phases. The importance of each phase is presented in Table 5.4.

Adoption Lifecycle Phases	HICT	SDSE	SDMA
Motivation	⊙	●	●
Conception	⊙	●	●
Proposal	●	●	●
Adoption Decision	●	●	●

Table 5.4: Importance of Adoption Lifecycle Phases in CICTD

The results in Table 5.4 illustrate that the adoption lifecycle phases have high importance while the decision making process for EAI adoption in CICTD. The importance of adoption phases can also be demonstrated by the new phases asserted by the interviewees. Thus, it can be noted that the adoption lifecycle phases (Figure 3.3) are validated through the EAI-DPP and fulfilling the *third objective* (Section 1.3) of this thesis. In the next section, the researcher presents the analysis of the mapping of each factor validated through the EAI-DDP on the different adoption lifecycle phases.

5.2.2.2.3 Testing Research Issue 3: Mapping EAI Adoption Factors on the Adoption Lifecycle Phases

Before commencing on the mapping of factors on the adoption lifecycle phases, the interviewees were explained how to perform the mapping. Thereafter, the interviewees were asked to map the factors (Figure 3.2) influencing EAI adoption on different phases of the adoption lifecycle (reported in Table 5.5). The interviewees went through a rigorous thinking process and mapped the factors (based on its influence) on each phase of the adoption lifecycle. The last column (results) in each phase in Table 5.5 illustrates the outcome of the mapping of factors by the interviewees. The results highlight varied findings from the mapping of factors on each phase. This can be attributed to the understanding and observation of each interviewee during the EAI-DPP project.

		Motivation				Conception				Proposal				Adoption Decision			
	Factors	HICT	SDSE	SDMA	Results	HICT	SDSE	SDMA	Results	HICT	SDSE	SDMA	Results	HICT	SDSE	SDMA	Results
PF	Project Champion	✓	–	✓	2/3	✓	–	–	1/3	✓	✓	–	2/3	✓	–	–	1/3
	Citizen's Satisfaction	–	✓	✓	2/3	–	✓	–	1/3	✓	✓	–	2/3	–	✓	–	1/3
	Critical Mass	✓	✓	✓	3/3	✓	✓	✓	3/3	✓	–	–	1/3	–	–	–	0/3
	Market Knowledge	–	✓	–	1/3	–	✓	✓	2/3	✓	–	–	1/3	✓	–	–	1/3
TF	Evaluation Frameworks	–	–	–	0/3	–	–	–	0/3	–	–	✓	1/3	✓	–	–	1/3
	Technological Risks	–	–	–	0/3	–	✓	✓	2/3	✓	✓	✓	3/3	✓	✓	✓	3/3
	IT Infrastructure	✓	–	–	1/3	✓	✓	✓	3/3	✓	✓	✓	3/3	–	✓	–	1/3
	Personnel IT Knowledge	–	✓	–	1/3	✓	✓	✓	3/3	✓	✓	–	2/3	✓	✓	–	2/3
	IT Sophistication	✓	✓	–	2/3	✓	✓	✓	3/3	✓	✓	–	2/3	–	✓	–	1/3
	Data Security and Privacy	✓	✓	–	2/3	✓	✓	✓	3/3	✓	✓	–	2/3	–	✓	–	1/3
SF	Top Management Support	✓	–	✓	2/3	–	✓	–	1/3	✓	✓	–	2/3	✓	✓	✓	3/3
	IT Support	–	✓	–	1/3	✓	✓	✓	3/3	✓	✓	✓	3/3	✓	✓	✓	3/3
	Higher Administrative Authority	✓	✓	✓	3/3	–	✓	✓	2/3	✓	✓	–	2/3	✓	✓	–	2/3
FF	Return on Investment	–	✓	✓	2/3	–	✓	✓	2/3	✓	✓	✓	3/3	✓	✓	✓	3/3
	Cost	–	–	✓	1/3	–	–	✓	1/3	✓	✓	✓	3/3	✓	✓	✓	3/3
OF	Centralisation	–	✓	–	1/3	–	✓	✓	2/3	✓	✓	–	2/3	✓	✓	–	2/3
	Managerial Capability	–	–	–	0/3	–	✓	✓	2/3	✓	✓	✓	3/3	✓	✓	✓	3/3
	Barriers	–	–	✓	1/3	–	✓	–	1/3	✓	✓	✓	3/3	✓	✓	✓	3/3
	Benefits	–	✓	✓	2/3	–	✓	–	1/3	–	✓	✓	2/3	✓	✓	✓	3/3
	Formalisation	–	✓	–	1/3	–	✓	–	1/3	✓	✓	✓	3/3	–	✓	–	1/3
	Size	✓	✓	✓	3/3	✓	✓	✓	3/3	✓	✓	–	2/3	✓	✓	–	2/3

Table 5.5: Mapping the Factors on the Adoption Lifecycle Phases in CICTD

The results of the mapping of factors for each phase are summarised in Tables 5.6, 5.7, 5.8 and 5.9 respectively. The factors with less (i.e. one interviewee supporting and other two not) and no (i.e. none of the interviewees supporting) support are discarded. The reason is that these factors had less influence or did not influence on a specific phase e.g. as reported in Table 5.5, in the motivation phase – market knowledge factor is supported by one interviewee, whereas, evaluation framework and technological risk is not support by any interview during the motivation phase, thus they were discarded. On the other hand, factors with full (i.e. all three interviewees supporting) and moderate (i.e. two interviewees supporting and third not supporting) support (as highlighted in the last column of each phase in Table 5.5) are utilised for further empirical research.

	Motivation Phase			
	Factors	**HICT**	**SDSE**	**SDMA**
PF	Project Champion	✓	–	✓
PF	Citizen's Satisfaction	–	✓	✓
PF	Critical Mass	✓	✓	✓
TF	IT Sophistication	✓	✓	–
TF	Data Security and Privacy	✓	✓	–
SP	Top Management Support	✓	–	✓
SP	Higher Administrative Authority	✓	✓	✓
FF	Return on Investment	–	✓	✓
OF	Benefits	–	✓	✓
OF	Size	✓	✓	✓

Table 5.6: Summarising the Factors with Full or Moderate Support on the Motivation Phase

	Conception Phase			
	Factors	**HICT**	**SDSE**	**SDMA**
PF	Critical Mass	✓	✓	✓
PF	Market Knowledge	–	✓	✓
TF	Technological Risks	–	✓	✓
TF	IT Infrastructure	✓	✓	✓
TF	Personnel IT Knowledge	✓	✓	✓
TF	IT Sophistication	✓	✓	✓
TF	Data Security and Privacy	✓	✓	✓
SF	IT Support	✓	✓	✓
SF	Higher Administrative Authority	–	✓	✓
FF	Return on Investment	–	✓	✓
OF	Centralisation	–	✓	✓
OF	Managerial Capability	–	✓	✓
OF	Size	✓	✓	✓

Table 5.7: Summarising the Factors with Full or Moderate Support on the Conception Phase

	Proposal Phase			
	Factors	HICT	SDSE	SDMA
PF	Project Champion	✓	✓	–
PF	Citizen's Satisfaction	✓	✓	–
TF	Technological Risks	✓	✓	✓
TF	IT Infrastructure	✓	✓	✓
TF	Personnel IT Knowledge	✓	✓	–
TF	IT Sophistication	✓	✓	–
TF	Data Security and Privacy	✓	✓	–
SF	Top Management Support	✓	✓	–
SF	IT Support	✓	✓	✓
SF	Higher Administrative Authority	✓	✓	–
FF	Return on Investment	✓	✓	✓
FF	Cost	✓	✓	✓
OF	Centralisation	✓	✓	–
OF	Managerial Capability	✓	✓	✓
OF	Barriers	✓	✓	✓
OF	Benefits	–	✓	✓
OF	Formalisation	✓	✓	✓
OF	Size	✓	✓	–

Table 5.8: Summarising the Factors with Full or Moderate Support on the Proposal Phase

	Adoption Decision Phase			
	Factors	HICT	SDSE	SDMA
TF	Technological Risks	✓	✓	✓
TF	Personnel IT Knowledge	✓	✓	–
SF	Top Management Support	✓	✓	✓
SF	IT Support	✓	✓	✓
SF	Higher Administrative Authority	✓	✓	–
FF	Return on Investment	✓	✓	✓
FF	Cost	✓	✓	✓
OF	Centralisation	✓	✓	–
OF	Managerial Capability	✓	✓	✓
OF	Barriers	✓	✓	✓
OF	Benefits	✓	✓	✓
OF	Size	✓	✓	–

Table 5.9: Summarising the Factors with Full or Moderate Support on the Adoption Decision Phase

Factors with either full or moderate support (Tables 5.6, 5.7, 5.8 and 5.9) are further utilised in the next section for prioritising their importance on each phase of the adoption lifecycle.

5.2.2.2.4 Testing Research Issue 4: Prioritising the Importance of EAI Adoption Factors on the Adoption Lifecycle Phases

Table 5.3 presents the importance of each factor using Miles and Huberman (1994) scale, whereas, Table 5.5 illustrates the mapping of factors on different phases of the adoption lifecycle and summarising the results in Tables 5.6, 5.7, 5.8 and 5.9 (as aforementioned). However, these tables do not illustrate the important of each factor on the adoption lifecycle phases. This section introduces AHP technique to prioritise the importance of factor (with full and moderate support as reported in Tables 5.6, 5.7, 5.8 and 5.9) influencing EAI adoption. In order to design AHP, the following steps are used:

- **Step 1 – Constructing the hierarchy model:** In order to study the factors related to EAI adoption in LGAs, the researcher established the EAI adoption factors hierarchy model (Figure 4.3). This step is explained in detail in Section 4.4.2.1. The remaining case studies follow the same hierarchy model as explained in Section 4.4.2.1.

- **Step 2 – Collecting data through pairwise comparison by interviews:** During the interview sessions, the interviewees highlighted that instead of having a list of factors, enclosing the list of factors in their respective factor categories can assist in better understanding the importance of EAI adoption factors. The researcher also notes that it can be easy to understand the relevance of a factor provided having factor categories in place. Before performing the pairwise comparisons, the interviewees were given instructions on how to conduct the comparison. The judgment of the importance of one factor over other can be made subjectively and converted to a numerical value using a scale illustrated in Table 4.3. The numerical values representing the judgments of the comparisons are arranged in a matrix for further calculations. The matrices corresponding to the individual pairwise ranking of the factors on adoption lifecycle phases is presented in Appendix D that represent the evaluation of the factors by HICT, SDSE and SDMA.

- **Step 3 – Determining Normalised Priority (Local) Weights:** To determine the normalised priority weights of all the factors (in a specific category) on different phases of the adoption lifecycle, the researcher used expert choice, a mathematical software for computing the weights. EC is an AHP-based multi-objective decision support tool (Salmeron and Herrero, 2005; Saaty, 1980). A mathematical theory first developed by the Expert Choice's founders, Thomas L. Saaty (1980). Expert choice is designed for the analysis, synthesis and validation of complex individual or group decisions. The software assists with the decision-making processes by providing decision-makers with a structure to organise and evaluate the importance of various objectives and the preferences of alternative solutions to a decision (Salmeron and Herrero, 2005; Saaty, 1980). Tables representing the normalised numerical ranking of factors (in their specific category) on different phases of the adoption lifecycle by HICT, SDSE and SDMA are presented in Appendix D.

- **Step 4 – Analysing and Calculating the Priority Weights:** Based on normalised priority weights from previous section (see Appendix D for tables from previous section), the relative priority importance of EAI adoption factors in a specific category are analysed and calculated in Tables 5.10, 5.11, 5.12 and 5.13. These priority weights are obtained by using the EC software and the conclusions drawn from them are the final results of the analysis of collective judgements provided by the panel of interviewees selected for CICTD. The results are based on the knowledge, judgement and understanding on the factors by all the interviewees at CICTD.

	Motivation Phase			
	Factors	**HICT**	**SDSE**	**SDMA**
PF	Project Champion	(1) 0.8571	(3) 0.0000	(1) 0.6866
PF	Citizen's Satisfaction	(3) 0.0000	(1) 0.8571	(2) 0.2134
PF	Critical Mass	(2) 0.1429	(2) 0.1428	(3) 0.1022
TF	IT Sophistication	(1) 0.8889	(1) 0.9000	(1) 0.0000
TF	Data Security and Privacy	(2) 0.1111	(2) 0.1000	(1) 0.0000
SP	Top Management Support	(1) 0.8889	(1) 0.0000	(1) 0.9000
SP	Higher Administrative Authority	(2) 0.1111	(1) 0.0000	(2) 0.1000
FF	Return on Investment	(1) 0.0000	(1) 0.0000	(1) 0.0000
OF	Benefits	(1) 0.0000	(1) 0.5000	(1) 0.8750
OF	Size	(1) 0.0000	(1) 0.5000	(2) 0.1249

Table 5.10: Individual Priority Weights of Factors on the Motivation Phase

	Conception Phase			
	Factors	**HICT**	**SDSE**	**SDMA**
PF	Critical Mass	(1) 0.0000	(2) 0.1428	(2) 0.8333
PF	Market Knowledge	(1) 0.0000	(1) 0.8571	(1) 0.1667
TF	Technological Risks	(5) 0.0000	(2) 0.2322	(4) 0.0700
TF	IT Infrastructure	(4) 0.0386	(5) 0.0288	(3) 0.1314
TF	Personnel IT Knowledge	(1) 0.6325	(4) 0.0642	(2) 0.2395
TF	IT Sophistication	(2) 0.2457	(1) 0.5514	(1) 0.5227
TF	Data Security and Privacy	(3) 0.0830	(3) 0.1233	(5) 0.0361
SF	IT Support	(1) 0.0000	(1) 0.8889	(1) 0.8750
SF	Higher Administrative Authority	(1) 0.0000	(2) 0.1111	(2) 0.1249
FF	Return on Investment	(1) 0.0000	(1) 0.0000	(1) 0.0000
OF	Centralisation	(1) 0.0000	(2) 0.0909	(3) 0.0566
OF	Managerial Capability	(1) 0.0000	(1) 0.8182	(1) 0.7553
OF	Size	(1) 0.0000	(2) 0.0909	(2) 0.1881

Table 5.11: Individual Priority Weights of Factors on the Conception Phase

	Proposal Phase			
	Factors	**HICT**	**SDSE**	**SDMA**
PF	Project Champion	(1) 0.9000	(1) 0.8889	(1) 0.0000
	Citizen's Satisfaction	(2) 0.1000	(2) 0.1111	(1) 0.0000
TF	Technological Risks	(2) 0.2395	(3) 0.1364	(1) 0.8889
	IT Infrastructure	(5) 0.0361	(2) 0.2452	(2) 0.1111
	Personnel IT Knowledge	(1) 0.5228	(4) 0.0347	(3) 0.0000
	IT Sophistication	(4) 0.0700	(1) 0.5488	(3) 0.0000
	Data Security and Privacy	(3) 0.1315	(4) 0.0347	(3) 0.0000
SF	Top Management Support	(3) 0.3281	(1) 0.7357	(1) 0.0000
	IT Support	(2) 0.3333	(2) 0.2114	(1) 0.0000
	Higher Administrative Authority	(1) 0.3384	(3) 0.0529	(1) 0.0000
FF	Return on Investment	(1) 0.8889	(2) 0.1000	(2) 0.1000
	Cost	(2) 0.1111	(1) 0.9000	(1) 0.9000
OF	Centralisation	(5) 0.0309	(3) 0.0541	(5) 0.0000
	Managerial Capability	(1) 0.5323	(1) 0.5208	(1) 0.6210
	Barriers	(4) 0.0677	(2) 0.1745	(2) 0.2354
	Benefits	(6) 0.0000	(2) 0.1745	(3) 0.1076
	Formalisation	(3) 0.1304	(4) 0.0219	(4) 0.0358
	Size	(2) 0.2385	(3) 0.0541	(5) 0.0000

Table 5.12: Individual Priority Weights of Factors on the Proposal Phase

	Adoption Decision Phase			
	Factors	**HICT**	**SDSE**	**SDMA**
TF	Technological Risks	(2) 0.1250	(1) 0.8889	(1) 0.0000
	Personnel IT Knowledge	(1) 0.8750	(2) 0.1111	(1) 0.0000
SF	Top Management Support	(1) 0.7250	(1) 0.7357	(1) 0.9000
	IT Support	(3) 0.0594	(2) 0.2114	(2) 0.1000
	Higher Administrative Authority	(2) 0.2156	(3) 0.0529	(3) 0.0000
FF	Return on Investment	(1) 0.8889	(2) 0.1000	(2) 0.1000
	Cost	(2) 0.1111	(1) 0.9000	(1) 0.9000
OF	Centralisation	(5) 0.0276	(3) 0.0346	(4) 0.0000
	Managerial Capability	(1) 0.5418	(2) 0.1695	(1) 0.7357
	Barriers	(3) 0.1309	(1) 0.5918	(2) 0.2113
	Benefits	(2) 0.2390	(2) 0.1695	(3) 0.0529
	Size	(4) 0.0606	(3) 0.0346	(4) 0.0000

Table 5.13: Individual Priority Weights of Factors on the Adoption Decision Phase

Tables 5.14, 5.15, 5.16 and 5.17 illustrate the global weights-based prioritisation of factors on different phases of the adoption lifecycle respectively. Their weights are calculated by aggregating the values of each factor and dividing the results by the number of interviewees. The results presented in these tables do not mean that any factor is unimportant. It merely exhibits the interviewees' perceptions about the importance of the factors on different phases of the adoption lifecycle. For example, in Table 5.14 IT sophistication and top management support are the most important factors having equal weights (0.5963) whereas return on investment as the least important factor having 0.0000 weight. The weight 0.0000 in Table 5.14 and other tables can be attributed to two reasons: (a) this factor (e.g. return on investment in Table 5.14) is the only factor mapped and prioritised from its specific factor category and/or (b) it is not mapped and prioritised (i.e. evaluated) by a specific interviewee. In the case, where one factor in a specific factor category is mapped on the adoption lifecycle phases, it cannot be prioritised. The reason is that a factor cannot have a pairwise comparison with itself. Thus, the researcher represents that factor with a weight of 0.0000.

Prioritising the Importance of Factors on the Motivation Phase		
Factor Categories	**Factors**	**Prioritisation Result**
Technological Factor	IT Sophistication	(1) 0.5963
Support Factor	Top Management Support	(1) 0.5963
Pressure Factor	Project Champion	(2) 0.5146
Organisational Factor	Benefits	(3) 0.4583
Pressure Factor	Citizen's Satisfaction	(4) 0.3568
Organisational Factor	Size	(5) 0.2083
Pressure Factor	Critical Mass	(6) 0.1293
Technological Factor	Data Security and Privacy	(7) 0.0704
Support Factor	Higher Administrative Authority	(7) 0.0704
Financial Factor	Return on Investment	(8) 0.0000

Table 5.14: Prioritising the Importance of Factors on the Motivation Phase

Prioritising the Importance of Factors on the Conception Phase		
Factor Categories	**Factors**	**Prioritisation Result**
Support Factor	IT Support	(1) 0.5879
Organisational Factor	Managerial Capability	(2) 0.5245
Technological Factor	IT Sophistication	(3) 0.4399
Pressure Factor	Market Knowledge	(4) 0.3414
Pressure Factor	Critical Mass	(5) 0.3254
Technological Factor	Personnel IT Knowledge	(6) 0.3121
Technological Factor	Technological Risks	(7) 0.1007
Organisational Factor	Size	(8) 0.0930
Technological Factor	Data Security and Privacy	(9) 0.0808
Support Factor	Higher Administrative Authority	(10) 0.0787
Technological Factor	IT Infrastructure	(11) 0.0663
Organisational Factor	Centralisation	(12) 0.0492
Financial Factor	Return on Investment	(13) 0.0000

Table 5.15: Prioritising the Importance of Factors on the Conception Phase

Prioritising the Importance of Factors on the Proposal Phase		
Factor Categories	**Factors**	**Prioritisation Result**
Financial Factor	Cost	(1) 0.6370
Pressure Factor	Project Champion	(2) 0.5963
Organisational Factor	Managerial Capability	(3) 0.5580
Technological Factor	Technological Risks	(4) 0.4216
Financial Factor	Return on Investment	(5) 0.3630
Support Factor	Top Management Support	(6) 0.3546
Technological Factor	IT Sophistication	(7) 0.2063
Technological Factor	Personnel IT Knowledge	(8) 0.1858
Support Factor	IT Support	(9) 0.1816
Organisational Factor	Barriers	(10) 0.1592
Technological Factor	IT Infrastructure	(11) 0.1308
Support Factor	Higher Administrative Authority	(12) 0.1304
Organisational Factor	Size	(13) 0.0975
Organisational Factor	Benefits	(14) 0.0940
Pressure Factor	Citizen's Satisfaction	(15) 0.0703
Organisational Factor	Formalisation	(16) 0.0627
Technological Factor	Data Security and Privacy	(17) 0.0554
Organisational Factor	Centralisation	(18) 0.0283

Table 5.16: Prioritising the Importance of Factors on the Proposal Phase

Prioritising the Importance of Factors on the Adoption Decision Phase		
Factor Categories	**Factors**	**Prioritisation Result**
Support Factor	Top Management Support	(1) 0.7869
Financial Factor	Cost	(2) 0.6370
Organisational Factor	Managerial Capability	(3) 0.4823
Financial Factor	Return on Investment	(4) 0.3629
Technological Factor	Technological Risks	(5) 0.3379
Technological Factor	Personnel IT Knowledge	(6) 0.3287
Organisational Factor	Barriers	(7) 0.3113
Organisational Factor	Benefits	(8) 0.1538
Support Factor	IT Support	(9) 0.1236
Support Factor	Higher Administrative Authority	(10) 0.0895
Organisational Factor	Size	(11) 0.0317
Organisational Factor	Centralisation	(12) 0.0207

Table 5.17: Prioritising the Importance of Factors on the Adoption Decision Phase

According to the empirical findings in this case study, only two factors were not validated i.e. formalisation and evaluation framework. The reasons as reported earlier in Section 5.2.2 are: (a) CICTD did not follow any formal procedure to assess EAI technological solution and (b) no evaluation framework was used to assess EAI technological solution but relied on the Softcom (and summarised in Table 5.3). Other factors have either directly or indirectly influenced the decision making process for EAI technological solution adoption. The mapping of factors reported in Tables 5.6, 5.7, 5.8 and 5.9 are associated with the prioritization results reported in Tables 5.14, 5.15, 5.16 and 5.17. Each factor mapped on each phase in Step 3, was prioritised based on its importance in that phase in Step 4. Detailed analysis of the prioritisation results is reported in Chapter 6, while revising the factors influencing EAI adoption at CICTD. The researcher discusses on the next case study conducted within LGA_A in the Citizen Services Department (CSD) on the top level electronic Forms (e-Forms) and CRM system integration project.

5.2.3 EAI Adoption in CSD – Top Level e-Forms and CRM Integration Project

The aim of top level e-Forms and CRM system integration project is to provide an electronic end-to-end process that ensures referential data integrity. So for this purpose the CSD project team ensured that all addresses entered in the system are valid and the mandatory information is entered in the systems. Moreover, the objectives of the project were to: (a) demonstrate and deliver the benefits of integrating cash receipting (i.e. via online payment system), CRM system and e-Forms, (b) re-establish and re-energise development and investment in CRM system and (c) demonstrate the benefits of business process re-engineering. Prior to start working on the top level e-Forms and CRM system integration project, CSD project team was working on an Electronic Service Delivery (ESD) project. However, ESD project was enterprise wide and the project team is still looking at this, thus, in essence ESD is the strategic view that the whole department is undertaking, whereas, the top level e-Forms and CRM system integration is a tactical project to achieve the purpose as aforesaid. This project also focused on re-engineering five specific business processes. These are: (a) issue and administration of green waste bins, (b) bulky item collection, (c) vehicle crossover applications, (d) skip license applications and (e) trade waste sack applications. In doing so, it would help CSD in justifying the decision to adopt EAI solution for ESD project as well.

- **Selection Process:** Like CICTD, since the last 3 years CSD also collaborated with their Integration Solution Consultant (ISC) [for confidentiality reasons using coded name instead of the real name of the consultant] to introduce CRM system. Initially, with the support from ISC expertise CSD project team did a market survey for the comparison and evaluation of different integration solutions to improve IT capabilities in CSD. As reported by the interviewees that:

  "... *having market knowledge about the technological solution is vital because otherwise CSD project team would not have been able to proceed further in this project and not able to enhance our IT capabilities* ... "

The interviewee also reported other factors that influenced CSD project team e.g. to select a technological solution that: (a) can solve the citizen queries and eventually, the citizens get satisfied by our service delivery process and (b) provide security and privacy of citizens' data because this involves citizen's sensitive information e.g. home addresses, council tax credits history, benefits etc. Whereas, the interviewee also said that there was also support and lots of pressure from the higher administrative authorities to share data with other departments. In addition, CSD project team also investigated and analysed the solutions of other councils and how it benefited them. After assessing all the aforesaid possible factors, the project team then selected and evaluated two products based on the Best Value category i.e. the top level e-Forms and the ISC CRM system and looked at the formats that each application could export/import.

The CSD project team came up with a number of options for EAI, which included direct database integration i.e., using XML/web services, for the ISC. In essence the top level e-Forms can export XML and it can integrate with web services and it could drop straight into a database. In addition, it can do Open Database Connectivity/ Java Database Connectivity (ODBC/JDBC) i.e. whatever kind of database connection CSD project team wanted to setup it could connect straight into the ISC database for CRM system. For this the CSD project team gave a number of options to ISC in terms of what method they wanted to use to integrate. So CSD project team decided to use an enterprise wide EAI solution i.e. web service so that member of CSD project team just broadcast and their web service would listen. But when CSD project started working, one of the issues that the team realised was that the e-Form solution was 24/7 and CSD project team do not take down as it just continues to process on and on.

Whereas ISC e-business server, which is taken up and down over night to run batch processes, so there is no point in linking an online system to an off-line system. So in essence if CSD project team were not careful, they can have forms trying to send something and not getting anything back then reporting back to the user an error, so it's failed and the reason for the failure is that CRM system is down for 2-3 hours for overnight. Then CSD project team came up with a method of just dropping XML files so the default system can create an XML file for information capture and just drop it straight into a folder, so basically it does not matter if the CRM system is on or off, it will just drop into a folder and then at a set time File Transfer Protocol (FTP) runs and if the FTP fails it just keeps waiting and try again and once the CRM system is back up so the FTP succeeds then deletes the successful files and then carry on. When the interviewees were asked for the reason that led CSD to follows this selection process, they mutually agreed and reported that:

> " ... *this was a kind of pilot evaluation study CSD project team did to test information flows both ways by using e-Forms and CRM system before selecting an integration solution to top level e-Forms and CRM system ...*"

- **Integration Process:** CSD project team followed the basic business needs and for this an interface was required from e-Forms to ISC CRM system. A citizen can request the creation of a Service Request (SR) in ISC CRM system over the Internet via e-Forms, which is a web Graphical User Interface (GUI). Depending on the type of service being requested depends on whether a payment needs to be taken. Those services that require payment are: (a) green waste bin service, (b) bulky item collection, (c) vehicle crossover application, (d) skip licence application and (e) trade waste sack collection. These payment services require credit/debit card payment, which is entered into online payments system via an online payment engine that is embedded within the e-Forms.

The request for service is then submitted, following payment if required. Top level e-Forms has a server component that plugs into the OfficeForms Server called OfficeForms Information Manager and provides a data collection service to assist in integration with third party vendors. It is able to receive data submitted from top level e-Forms and store it in the chosen formats such as: (a) in the original OfficeForms Data Format (OFD), (b) in a Comma Separate Value (CSV) file, (c) in an XML document, (d) as a PDF document, (e) in a database record, (f) in a CSV record or (g) by calling a web service, information can be conveyed to and stored in third-party applications, in this instance it would be ISC CRM system. The reply from the web service can also be returned to the form, allowing the form content to be populated with returned data.

One of the data formats listed above will be used to integrate into ISC CRM system. Before this data is used to create a SR automatically in CRM system, the address that is supplied by the user is validated to match it to the address stored in CRM system. A match between the two addresses is determined by matching the address details in the CRM database to find a party record. If there is a match, then the SR is automatically created in CRM system with the data supplied from e-Forms. If no party record is found then a manual process needs to take place. This is in the form of a notification from ISC workflow where a designated CSD user group is supplied with all the details provided by the customer in e-Forms in the message body and the user needs to decide on what the correct address is. The user then enters the citizen details to create the SR in CRM system manually. The standard ISC workflow that creates the SR will include a customisation so that only those citizens that have entered their details over the Internet via e-Forms and where a payment is required will receive this email. This will also be the case for those users where they had a miss-match with their address and have to be manually rectified.

- **CSD Top Level e-Forms and CRM System Integration Project:** The project initiated by CSD project team using EAI improves data collection with intelligent, dynamic top level e-Forms that are easier to use than paper. Financial capability of CSD was improved i.e. cost fell because quality data reduced the form rejection rates and received e-Forms that did not need to be manually keyed-in, whereas, ROI was not validated. The interviewees reported that:

  "... *due to silo mentality in CSD we were not able to prove the return on our investment in this project*..."

  Several *benefits* were identified through the project e.g. saving staff time, reducing the total time to process a form and greater accuracy and reliability of data. Figure 5.5 illustrates the systems involved in this integration project.

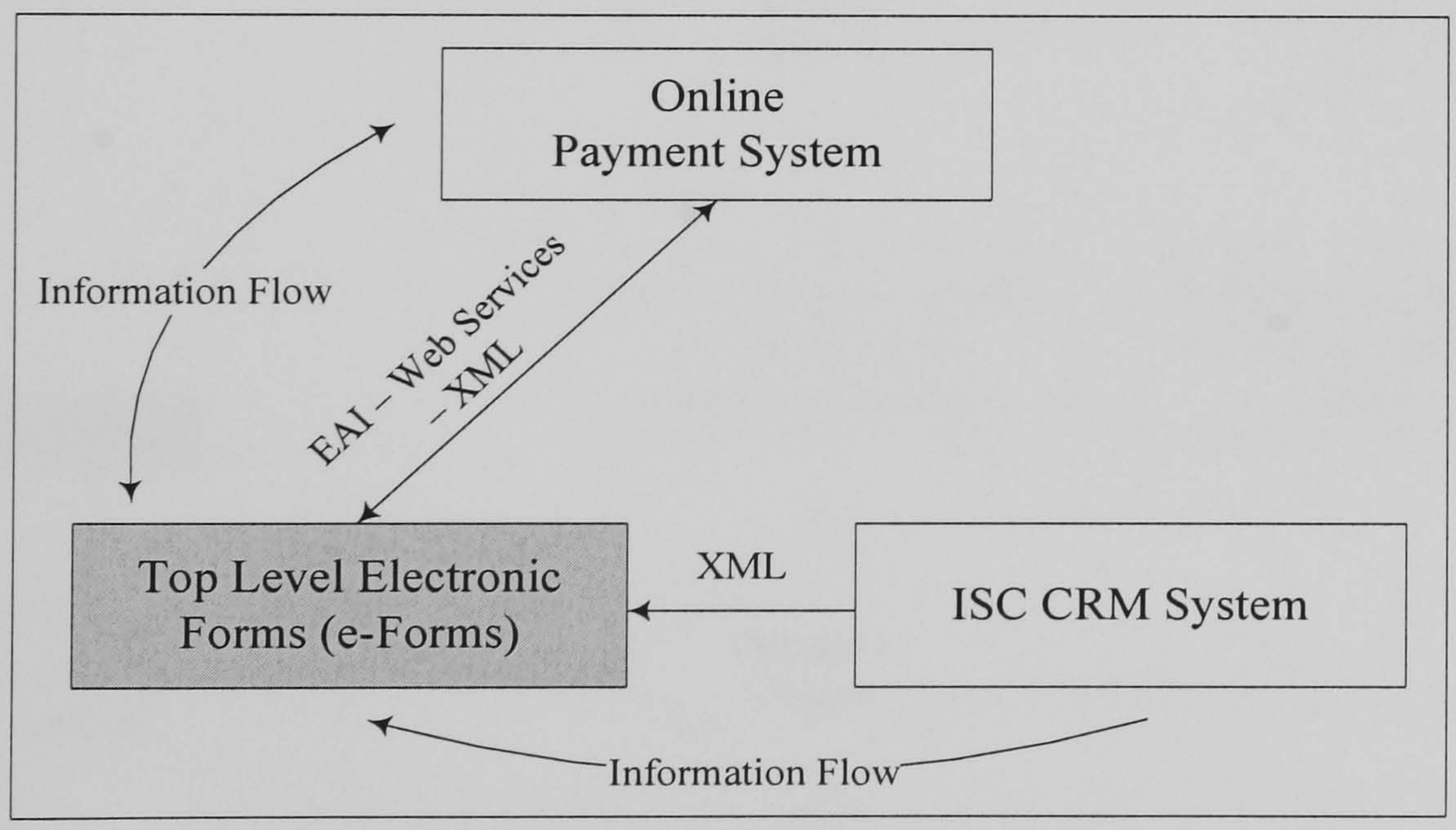

Figure 5.5: Top Level e-Forms and CRM System Integration Project

- **The Solution:** Following are the business rules that CSD project team had to follow: (a) the response of the payment processing between ISC CRM systems to online payment system is in real time i.e. several seconds, (b) the response of the service request processing from e-Forms into ISC CRM system in real time i.e. several minutes, (c) no emails are to be sent from online payment system to the citizen. Although the email still needs to be entered into the online payment system, (d) the online payment system requires the citizen name and address, (e) the citizen type is 'Location', (f) email confirmation is only required for those citizens that have entered their details over the Internet via top level e-Forms and where payment is required and (g) if the online payment system is unavailable, the payment request is cancelled by system i.e. the request is not queued and then processed when online payment system becomes available again.

The process of creation of SR and custom email notification required for SR's payment is demonstrated in Figure 5.6.

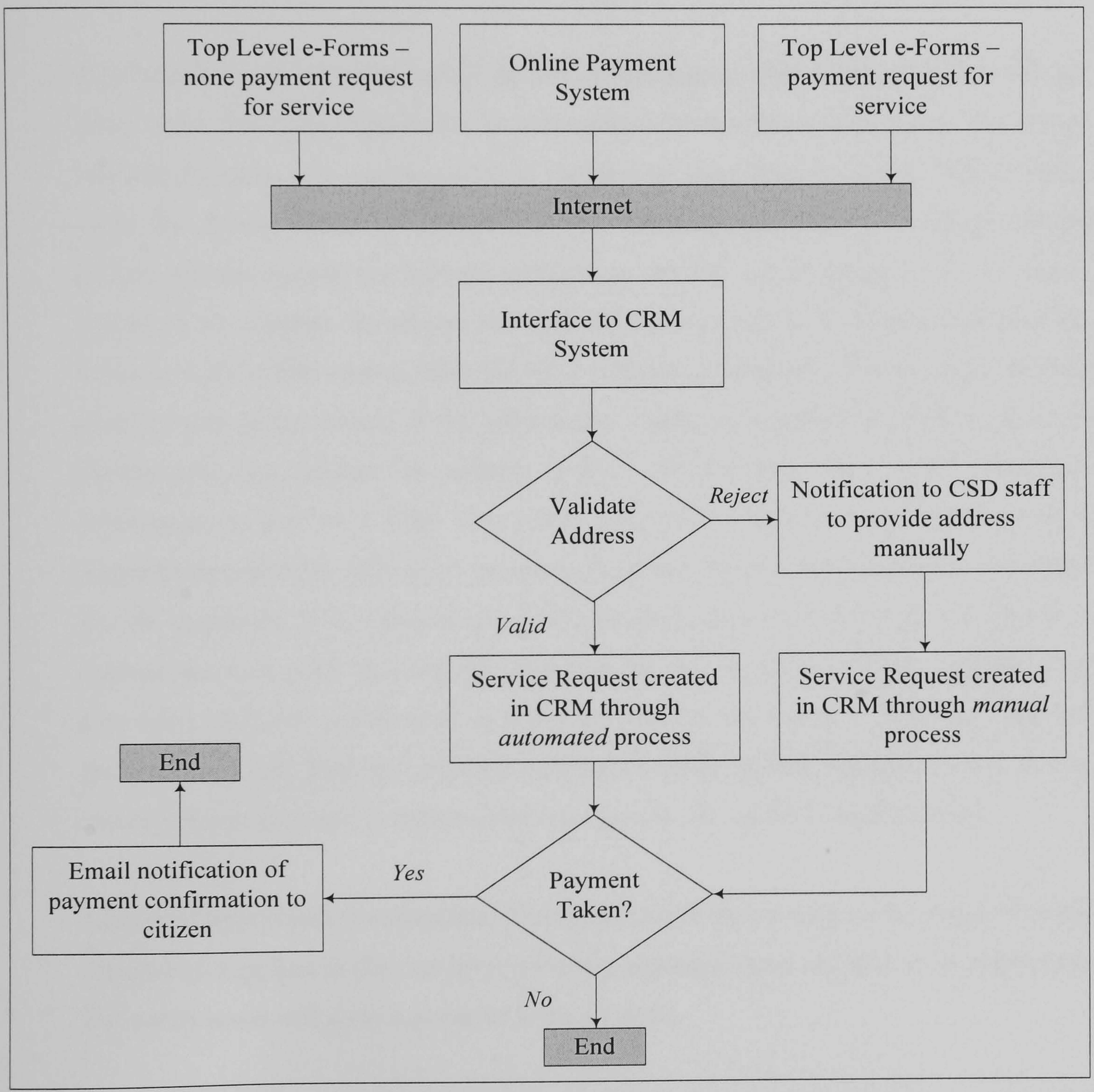

Figure 5.6: Creation of SR and Custom Email Notification required for SR's Payment

- **Integration from Top Level e-Forms to ISC CRM System:** The integration from top level e-Forms to ISC CRM system can be undertaken in a number of ways. The information manager from top level is the means of collecting the data that is submitted by the citizen and providing it in different data formats. ISC CRM system will need certain data fields in order to create a SR. Once these details are provided to ISC CRM system a custom package will validate the address details input by the citizen from top level e-Forms against the address details in the ISC CRM database. The address will be validated from the following address fields: (a) building number and (b) post code. The citizen will still need to provide all the address details such as street name and town, as if there is no matching of address then there is a manual process described in the next section for creating the SR. If there is a matching of the address, then the SR will be created automatically. A custom package will call the SR Application Programming Interfaces (API) and the citizen details and request for service details will be provided.

- **Confirmation of payment email to Top Level users:** This requirement is only for those users that have requested a SR through top level e-Forms and where the service requires payment. The email address is supplied by the citizen in the top level e-Form. Once the citizen details are provided to ISC CRM system, there is validation of the citizen address against the address supplied in the ISC CRM database, as mentioned earlier. If the address the citizen has supplied through top level e-Forms matches the address in ISC CRM system, then the SR is created. If payment has been taken, then an email is sent to the citizen. If the address the citizen has supplied through top level e-Forms does not matches the address in ISC CRM system, then an ISC workflow notification is sent to a CSD user group at LGA_A with all the citizen details to manually create a SR. The LGA_A user will determine what the address is and create the SR manually. If this request involved payment, then a SR attribute will be set to indicate that it is a SR that requires payment and has had to be entered manually with data from top level and as such requires an email to the citizen. Therefore, this will distinguish an SR from one that was created in CRM system through the call centre, which requires payment as this process does not require an email confirmation.

- **Address Miss-Match Notification:** This notification will contain all the details that the citizen has supplied in the top level e-Forms, although these are still to be confirmed. The notification will go to a group of LGA_A users.

- **Email Confirmation Notification:** This notification is sent to the citizen who created a SR through top level e-Forms and where a payment was required. The email address for this notification is provided by the citizens. The details that are included in the notification are still to be determined, but will include a payment reference number.

5.2.3.1 Findings from the Top Level e-Forms and CRM Integration Project

The main issues derived from this project presented earlier are summarised below along with the comments from the interviewees:

- **EAI Selection Process:** The decision for selecting EAI solution for the project was made by the head of CSD. However, the interviewee reported that one of the risks in selecting EAI was of opting for an appropriate EAI solution supplier. The reason is that there is plethora of EAI products available with several suppliers with their EAI products. Thus, it was difficult to select a supplier that can be able to provide a solution to their specifications. In addition, the interviewees also stated some other risks while adopting EAI (as reported in Appendix C). Thus, after consulting with the head of IT, CSD project team bought in ISC consultants to do the scoping work and technical documentation for the top level e-Forms and CRM integration project implementation for selecting an EAI solution. The web manager was asked the reasons that motivated them to adopt an EAI solution. He said that:

  "*... we were motivated because EAI improves the efficiency of business processes, service delivery and assist in streamlining data ...*"

  Initially, CSD project team provided the ISC consultants with the some well-documented options from the top level e-Forms site. The ISC consultants in turn augmented the documents, which was a kind of their project initiation and the ISC consultants came up with the XML formats that CSD project team need to follow for implementing the project. The collaboration between CSD and ISC consultants also created a final document that both parties i.e. CSD project team and the ISS consultants, signed on the XML format for top level e-Forms and CRM system integration project. The researcher notes here that CSD project team followed formalised steps for selecting XML format for the project. The interviewees mutually agreed that:

  "*... it is important to have standardised way of working in the organisation because it is be key factor towards successful implementation of a project ...*"

  In addition, several other benefits were also identified and the researcher asked the interviewees to rank them (as reported in Appendix C). The efforts to enhance the service delivery process at LGA_A by adopting EAI solution resulted in CSD project team facing several barriers e.g. silo mentality and ownership of data were the most significant barriers. The reason is that the staff did not wanted to change their ways of working in CSD and in addition, did not wanted to share that their data with other departments. Numerous other barriers were also identified from the top level e-Forms and CRM system integration project (as reported in Appendix C).

- **EAI Adoption:** As aforesaid the researcher discussed on several factors. The aforementioned arguments on these factors represent that these factors have influenced EAI adoption at CSD. In addition, to these factors, the researcher presented several other factors in Sections 3.2.1 and 3.3 that have also influenced the decision making process for EAI adoption. All of the other factors were also validated through this project. For example, the interviewees reported that:

  "*... support from top management and project champion is very vital for any organisation and have a crucial role to play in supporting and leading a team for any project ...*"

  The interviewees also said that while initiating on this project, they required support from the top management for approval and a project champion to lead the project. Although, it was to adopt an integration technological solution i.e. EAI but there were also several business perspectives to this project. For example, a business point of view was how EAI can facilitate data sharing between department, other, how to save money by reengineering business processes through EAI etc. For these issues the project manager said that CSD needed a project champion otherwise it would have been very critical to back this project. In addition, the researcher also notes from the interview that size of the LGA_A and the community the authority serves is also important. The interviewees mutually agreed to the reason:

  " *... yes organisational and community size is vital as this is a large borough and compared to other authorities we have greater resources, perform numerous functional activities and are in more need of new technologies to improve our service delivery to our community. So bigger the organisational and community size, easy to get more funding from the central government ...*"

- **EAI Integration Approach for Project Implementation:** The integration approach is per application at the moment. So CSD project team has a proof of concept with ISC CRM system, where CSD project team can prove the project team can integrate but the technology is specific to the application. The next stage is to have something that can be replicated across applications.

5.2.3.2 LGA_A CSD – Analysing the Issues under Research

The aforementioned views on the top level e-Forms and CRM system integration project carried out in CSD, further support the aim of this research and demonstrate that there is scope for timeliness and novel research in this area. To test the conceptual model for EAI adoption in LGAs (presented in Figure 3.7), the researcher follows the research issues as summarised in Table 5.2 and analyses these research issues in the following sections.

5.2.3.2.1 Testing Research Issue 1: Factors Influencing EAI Adoption in LGAs

The interviewees were asked to comment on the importance and the involvement of EAI adoption factors in the top level e-Forms and CRM integration project. The results illustrate the understanding and observation of each interviewee during the project. Table 5.18 provides with the analysis of the factors based on the views from the interviewees.

	Factors Influencing EAI Adoption	HIT	WM	PM
PF	Project Champion	●	●	●
	Citizen's Satisfaction	●	●	⦿
	Critical Mass	⦿	⦿	●
	Market knowledge	⦿	⦿	⦿
TF	Evaluation Frameworks	⦿	⦿	●
	Technological Risks	●	⦿	●
	IT Infrastructure	●	●	○
	Personnel IT Knowledge	●	⦿	⦿
	IT Sophistication	⦿	●	⦿
	Data Security and Privacy	●	⦿	●
SF	Top Management Support	●	●	●
	IT Support	●	⦿	⦿
	Higher Administrative Authority	●	●	●
FF	Return on Investment	○	⦿	○
	Cost	●	⦿	●
OF	Centralisation	●	●	●
	Managerial Capability	●	⦿	●
	Barriers	●	●	●
	Benefits	●	●	●
	Formalisation	●	●	●
	Size	●	●	●

Table 5.18: Validation of Factors Influencing EAI Adoption in CSD

Table 5.18 depicts mixed results on the importance of factors influencing EAI adoption. However, with the conformity of these factors with moderate and high importance, the researcher asserts that the proposed factors (Figure 3.2) are validated through this project and fulfilling the *second objective* (Section 1.3) of this thesis. Results demonstrated in Table 5.3 (in the previous case study) and Table 5.18 in this case study; further strengthen the researcher's justification on the importance and involvement of EAI adoption factors through LGA_A case organisation. In the subsequent sections, the researcher presents detailed analysis of the importance of EAI adoption factors.

5.2.3.2.2 Testing Research Issue 2: Adoption Lifecycle Phases

The interviewees were asked to comment and illustrate the importance of these phases based on this project. They agreed that CSD project team come across these phases for this project. The web manager further added that:

> "... *I think it is a reasonable lifecycle and does reflect the adoption processes at CSD for the top level e-Forms and CRM system integration project* ..."

The project manager also commented on the importance of these phases based on the top level e-Forms and CRM integration project. He agreed that in CSD we have come across these phases for this project. The project manager further added 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 borough to take the decision. So I think it is a fair lifecycle and does reflect the adoption processes at CSD for the top level e-Forms and CRM integration project* ..."

Whereas, the head of IT reported that:

> "... *the adoption phases are important. It is quite observable and understandable that these phases exist but not verbally mentioned or discussed* ... "

Thereafter, the interviewees were also asked to illustrate the importance of the adoption lifecycle phases. The importance of each phase is presented in Table 5.19.

Adoption Lifecycle Phases	HIT	WM	PM
Motivation	●	●	●
Conception	●	●	●
Proposal	●	●	●
Adoption Decision	●	●	●

Table 5.19: Importance of Adoption Lifecycle Phases in CSD

It appears from the analysis of the project presented earlier that the adoption lifecycle phases (Figure 3.3) are validated through this and fulfilling the *third objective* (Section 1.3) of this thesis. In the next section, the researcher presents the analysis of the mapping of each factor validated through the project on the different adoption lifecycle phases.

5.2.3.2.3 Testing Research Issue 3: Mapping EAI Adoption Factors on the Adoption Lifecycle Phases

Similar to the previous case study, in this case study the researcher followed the same pattern and before commencing on the mapping of factors on the adoption lifecycle phases, the interviewees were explained how to perform the mapping. Thereafter, the interviewees were asked to map the factors (Figure 3.2) influencing EAI adoption on different phases of the adoption lifecycle (reported in Table 5.20). The interviewees mapped the factors (based on their influence) on each phase of the adoption lifecycle. The last (results) column in each phase in Table 5.20 illustrates the outcome of the mapping of factors by the interviewees for CSD integration project. The results highlight varied findings from the mapping of factors on each phase. Yet again this can be attributed to the understanding and observation of each interviewee during the top level e-Forms and CRM integration project.

		Motivation				Conception				Proposal				Adoption Decision			
	Factors	HIT	WM	PM	Results	HIT	WM	PM	Results	HIT	WM	PM	Results	HIT	WM	PM	Results
PF	Project Champion	✓	–	✓	2/3	✓	–	–	1/3	✓	✓	✓	3/3	✓	✓	✓	3/3
	Citizen's Satisfaction	–	✓	✓	2/3	–	–	–	0/3	✓	–	–	1/3	–	–	–	0/3
	Critical Mass	✓	✓	✓	3/3	✓	–	✓	2/3	✓	–	–	1/3	–	–	–	0/3
	Market Knowledge	–	–	–	0/3	–	–	✓	1/3	✓	✓	–	2/3	✓	–	–	1/3
TF	Evaluation Frameworks	✓	–	–	1/3	–	✓	–	1/3	–	–	✓	1/3	✓	–	–	1/3
	Technological Risks	–	–	–	0/3	–	–	✓	1/3	✓	✓	✓	3/3	✓	✓	✓	3/3
	IT Infrastructure	✓	✓	–	2/3	✓	✓	✓	3/3	✓	–	✓	2/3	–	–	–	0/3
	Personnel IT Knowledge	–	–	–	0/3	✓	–	✓	2/3	✓	✓	–	2/3	✓	✓	–	2/3
	IT Sophistication	✓	–	✓	2/3	✓	✓	✓	3/3	✓	–	–	1/3	–	–	–	0/3
	Data Security and Privacy	✓	✓	–	2/3	✓	–	✓	2/3	✓	✓	✓	3/3	–	–	–	0/3
SF	Top Management Support	✓	✓	✓	3/3	–	–	–	0/3	✓	–	–	1/3	✓	✓	✓	3/3
	IT Support	–	–	–	0/3	✓	✓	✓	3/3	✓	✓	✓	3/3	✓	–	✓	2/3
	Higher Administrative Authority	✓	✓	✓	3/3	–	–	✓	1/3	✓	–	–	1/3	✓	✓	–	2/3
FF	Return on Investment	–	✓	✓	2/3	–	–	–	0/3	✓	✓	✓	3/3	✓	–	–	1/3
	Cost	–	–	✓	1/3	–	–	✓	1/3	✓	–	✓	2/3	✓	✓	✓	3/3
OF	Centralisation	–	✓	–	1/3	–	–	✓	1/3	✓	–	–	1/3	✓	✓	–	2/3
	Managerial Capability	–	✓	–	1/3	–	–	✓	1/3	✓	–	✓	2/3	✓	–	✓	2/3
	Barriers	✓	–	✓	2/3	✓	–	–	1/3	✓	✓	✓	3/3	✓	–	✓	2/3
	Benefits	–	–	✓	1/3	–	–	–	0/3	–	✓	✓	2/3	✓	–	✓	2/3
	Formalisation	–	–	–	0/3	–	–	–	0/3	✓	✓	✓	3/3	–	✓	–	1/3
	Size	–	–	✓	1/3	–	–	✓	1/3	✓	–	–	1/3	✓	✓	–	2/3

Table 5.20: Mapping the Factors on the Adoption Lifecycle Phases in CSD

The results of the mapping of factors for each phase are summarised in Tables 5.21, 5.22, 5.23 and 5.24 respectively. The factors with less (i.e. one interviewee supporting and other two not) and no (i.e. none of the interviewees supporting) support are discarded. The reason is that these factors had less influence or did not influence on a specific phase (as reported in Table 5.20). On the other hand, factors with full (i.e. all three interviewees supporting) and moderate (i.e. two interviewees supporting and third not supporting) support (as highlighted in the last column of each phase in Table 5.20) are utilised for further empirical research.

	Motivation Phase			
	Factors	HIT	WM	PM
PF	Project Champion	✓	–	✓
PF	Citizen's Satisfaction	–	✓	✓
PF	Critical Mass	✓	✓	✓
TF	IT Infrastructure	✓	✓	–
TF	IT Sophistication	✓	–	✓
TF	Data Security and Privacy	✓	✓	–
SF	Top Management Support	✓	✓	✓
FF	Return on Investment	–	✓	✓
OF	Barriers	✓	–	✓

Table 5.21: Summarising the Factors with Full or Moderate Support on the Motivation Phase

	Conception Phase			
	Factors	HICT	SDSE	SDMA
PF	Critical Mass	✓	–	✓
TF	IT Infrastructure	✓	✓	✓
TF	Personnel IT Knowledge	✓	–	✓
TF	IT Sophistication	✓	✓	✓
TF	Data Security and Privacy	✓	–	✓
SF	IT Support	✓	✓	✓

Table 5.22: Summarising the Factors with Full or Moderate Support on the Conception Phase

	Proposal Phase			
	Factors	HIT	WM	PM
PF	Project Champion	✓	✓	✓
PF	Market Knowledge	✓	✓	–
TF	Technological Risks	✓	✓	✓
TF	IT Infrastructure	✓	–	✓
TF	Personnel IT Knowledge	✓	✓	–
TF	Data Security and Privacy	✓	✓	✓
SF	IT Support	✓	✓	✓
FF	Return on Investment	–	✓	✓
OF	Managerial Capability	✓	–	✓
OF	Barriers	✓	✓	✓
OF	Benefits	–	✓	✓
OF	Formalisation	✓	✓	✓

Table 5.23: Summarising the Factors with Full or Moderate Support on the Proposal Phase

	Adoption Decision Phase			
	Factors	HIT	WM	PM
PF	Project Champion	✓	✓	✓
TF	Technological Risks	✓	✓	✓
TF	Personnel IT Knowledge	✓	✓	–
SF	Top Management Support	✓	✓	✓
SF	IT Support	✓	–	✓
SF	Higher Administrative Authority	✓	✓	–
FF	Cost	✓	✓	✓
OF	Centralisation	✓	✓	–
OF	Managerial Capability	✓	–	✓
OF	Barriers	✓	–	✓
OF	Benefits	✓	–	✓
OF	Size	✓	✓	–

Table 5.24: Summarising the Factors with Full or Moderate Support on the Adoption Decision Phase

Factors with either full or moderate support (Tables 5.21, 5.22, 5.23 and 5.24) are utilised in the next section for prioritising their importance on each phase of the adoption lifecycle.

5.2.3.2.4 Testing Research Issue 4: Prioritising the Importance of EAI Adoption Factors on the Adoption Lifecycle Phases

Tables 5.3 and 5.18 present the importance of each factor, whereas, Tables 5.5 and 5.20 illustrate the mapping of factors on different phases of the adoption lifecycle and summarising the results in Tables 5.21, 5.22, 5.23 and 5.24 (for this case study). However, these tables do not illustrate the importance of each factor on the adoption lifecycle phases. This section prioritises the importance of factor (with full and moderate support as reported in Tables 5.21, 5.22, 5.23 and 5.24) influencing EAI adoption. In order to prioritise the importance of factors, the following steps are followed:

- **Step 1 – Constructing the hierarchy model:** Section 4.4.2.1 explains this step in detail.

- **Step 2 – Collecting data through pairwise comparison by interviews:** Before performing the pairwise comparisons, all the interviewees were given instructions on how to conduct the comparison. The matrices corresponding to the individual pairwise ranking of the factors on each phase of the adoption lifecycle is presented in Appendix D that represent the evaluation of the factors by HIT, WM and PM.

- **Step 3 – Determining Normalised Priority (Local) Weights:** The normalised priority weights of all the factors (in a specific category) on different phases of the adoption lifecycle for HIT, WM and PM are presented in Appendix D.

- **Step 4 – Analysing and Calculating the Priority Weights:** Based on normalised priority weights from previous tables (see Appendix D for tables from previous section), the relative priority importance of EAI adoption factors in a specific category are analysed and calculated in Tables 5.25, 5.26, 5.27 and 5.28. These priority weights are obtained by using the EC software and the conclusions drawn from them are the final results of the analysis of collective judgements provided by the panel of interviewees selected for CSD. The results are based on the knowledge and understanding on the factor categories by all the interviewees in CSD.

	Motivation Phase			
	Factors	**HIT**	**WM**	**PM**
PF	Project Champion	(1) 0.8750	(3) 0.0000	(1) 0.6924
	Citizen's Satisfaction	(3) 0.0000	(1) 0.9000	(2) 0.2233
	Critical Mass	(2) 0.1249	(2) 0.1000	(3) 0.0843
TF	IT Infrastructure	(3) 0.0675	(2) 0.1250	(1) 0.0000
	IT Sophistication	(1) 0.7674	(3) 0.0000	(1) 0.0000
	Data Security and Privacy	(2) 0.1650	(1) 0.8750	(1) 0.0000
SF	Top Management Support	(1) 0.0000	(1) 0.0000	(1) 0.0000
FF	Return on Investment	(1) 0.0000	(1) 0.0000	(1) 0.0000
OF	Barriers	(1) 0.0000	(1) 0.0000	(1) 0.0000

Table 5.25: Individual Priority Weights of Factors on the Motivation Phase

	Conception Phase			
	Factors	**HIT**	**WM**	**PM**
PF	Critical Mass	(1) 0.0000	(1) 0.0000	(1) 0.0000
TF	IT Infrastructure	(4) 0.0388	(2) 0.1667	(3) 0.1136
	Personnel IT Knowledge	(1) 0.6300	(3) 0.0000	(2) 0.2474
	IT Sophistication	(2) 0.2435	(1) 0.8333	(1) 0.5920
	Data Security and Privacy	(3) 0.0875	(3) 0.0000	(4) 0.0469
SF	IT Support	(1) 0.0000	(1) 0.0000	(1) 0.0000

Table 5.26: Individual Priority Weights of Factors on the Conception Phase

	Proposal Phase			
	Factors	**HIT**	**WM**	**PM**
PF	Project Champion	(1) 0.9000	(1) 0.9000	(1) 0.0000
	Market Knowledge	(2) 0.1000	(2) 0.1000	(1) 0.0000
TF	Technological Risks	(2) 0.2481	(1) 0.7470	(1) 0.7353
	IT Infrastructure	(4) 0.0453	(4) 0.0000	(2) 0.2030
	Personnel IT Knowledge	(1) 0.5963	(2) 0.1886	(4) 0.0000
	Data Security and Privacy	(3) 0.1101	(3) 0.0644	(3) 0.0616
SF	IT Support	(1) 0.0000	(1) 0.0000	(1) 0.0000
FF	Return on Investment	(1) 0.0000	(1) 0.0000	(1) 0.0000
OF	Managerial Capability	(1) 0.7353	(4) 0.0000	(1) 0.6312
	Barriers	(3) 0.0616	(1) 0.7250	(2) 0.2201
	Benefits	(4) 0.0000	(2) 0.2254	(3) 0.1163
	Formalisation	(2) 0.2030	(3) 0.0594	(4) 0.0413

Table 5.27: Individual Priority Weights of Factors on the Proposal Phase

	Adoption Decision Phase			
	Factors	HIT	WM	PM
PF	Project Champion	(1) 0.0000	(1) 0.0000	(1) 0.0000
TF	Technological Risks	(2) 0.1250	(1) 0.8889	(1) 0.0000
TF	Personnel IT Knowledge	(1) 0.8750	(2) 0.1111	(1) 0.0000
SF	Top Management Support	(1) 0.5482	(1) 0.9000	(1) 0.9000
SF	IT Support	(3) 0.0919	(3) 0.0000	(2) 0.1000
SF	Higher Administrative Authority	(2) 0.3451	(2) 0.1000	(3) 0.0000
FF	Cost	(1) 0.0000	(1) 0.0000	(1) 0.0000
OF	Centralisation	(5) 0.0408	(1) 0.8333	(4) 0.0000
OF	Managerial Capability	(1) 0.5174	(3) 0.0000	(1) 0.7377
OF	Barriers	(3) 0.1439	(3) 0.0000	(2) 0.2074
OF	Benefits	(2) 0.2289	(3) 0.0000	(3) 0.0547
OF	Size	(4) 0.0687	(2) 0.1667	(4) 0.0000

Table 5.28: Individual Priority Weights of Factors on the Adoption Decision Phase

Tables 5.29, 5.30, 5.31 and 5.32 illustrate the global weights-based prioritisation of factors on the adoption lifecycle phases. Their weights are calculated by aggregating the values of each factor and dividing the results by the number of interviewees. The results presented in these tables do not mean that any factor is unimportant. It merely shows the interviewees' perceptions about the importance of the factors on different phases of the adoption lifecycle.

Prioritising the Importance of Factors on the Motivation Phase		
Factor Categories	Factors	Prioritisation Result
Pressure Factor	Project Champion	(1) 0.5225
Pressure Factor	Citizen's Satisfaction	(2) 0.3744
Technological Factor	Data Security and Privacy	(3) 0.3467
Technological Factor	IT Sophistication	(4) 0.2558
Pressure Factor	Critical Mass	(5) 0.1031
Technological Factor	IT Infrastructure	(6) 0.0642
Support Factor	Top Management Support	(7) 0.0000
Financial Factor	Return on Investment	(7) 0.0000
Organisational Factor	Barriers	(7) 0.0000

Table 5.29: Prioritising the Importance of Factors on the Motivation Phase

Prioritising the Importance of Factors on the Conception Phase		
Factor Categories	Factors	Prioritisation Result
Technological Factor	IT Sophistication	(1) 0.5563
Technological Factor	Personnel IT Knowledge	(2) 0.2925
Technological Factor	IT Infrastructure	(3) 0.1064
Technological Factor	Data Security and Privacy	(4) 0.0448
Pressure Factor	Critical Mass	(5) 0.0000
Support Factor	IT Support	(5) 0.0000

Table 5.30: Prioritising the Importance of Factors on the Conception Phase

Prioritising the Importance of Factors on the Proposal Phase		
Factor Categories	**Factors**	**Prioritisation Result**
Pressure Factor	Project Champion	(1) 0.6000
Technological Factor	Technological Risks	(2) 0.5768
Organisational Factor	Managerial Capability	(3) 0.4555
Organisational Factor	Barriers	(4) 0.3356
Technological Factor	Personnel IT Knowledge	(5) 0.2616
Organisational Factor	Benefits	(6) 0.1139
Organisational Factor	Formalisation	(7) 0.1012
Technological Factor	IT Infrastructure	(8) 0.0828
Technological Factor	Data Security and Privacy	(9) 0.0787
Pressure Factor	Market Knowledge	(10) 0.0666
Support Factor	IT Support	(11) 0.0000
Financial Factor	Return on Investment	(11) 0.0000

Table 5.31: Prioritising the Importance of Factors on the Proposal Phase

Prioritising the Importance of Factors on the Adoption Decision Phase		
Factor Categories	**Factors**	**Prioritisation Result**
Support Factor	Top Management Support	(1) 0.7827
Organisational Factor	Managerial Capability	(2) 0.4184
Technological Factor	Technological Risks	(3) 0.3379
Technological Factor	Personnel IT Knowledge	(4) 0.3287
Organisational Factor	Centralisation	(5) 0.2914
Organisational Factor	Barriers	(6) 0.1171
Support Factor	Higher Administrative Authority	(7) 0.1139
Organisational Factor	Benefits	(8) 0.0945
Organisational Factor	Size	(9) 0.0785
Support Factor	IT Support	(10) 0.0639
Pressure Factor	Project Champion	(11) 0.0000
Financial Factor	Cost	(11) 0.0000

Table 5.32: Prioritising the Importance of Factors on the Adoption Decision Phase

According to the empirical findings in this case study, only one factor was not validated i.e. ROI. For the reason as reported earlier in Section 5.2.3 by the interviewee is: (a) that due to silo mentality prevailing in the department, the project team could not prove the ROI on the top level e-Forms and CRM integration project (as summarised in Table 5.18). Other factors have either directly or indirectly influenced the decision making process for EAI technological solution adoption. The mapping of factors reported in Tables 5.21, 5.22, 5.23 and 5.24 are associated with the prioritisation results reported in Tables 5.29, 5.30, 5.31 and 5.32. Each factor mapped on each phase in Step 3, was prioritised based on its importance in that phase in Step 4. Detailed analysis of the prioritisation results is reported in Chapter 6, while revising the factors influencing EAI adoption in CSD.

5.2.4 Summarising the Findings Obtained from LGA_A Projects

The empirical findings illustrated in Sections 5.2.2 and 5.2.3 indicates that the proposed conceptual model (Figure 3.7) can be used for EAI adoption in LGAs. The reason is that both the case studies have validated the research issues reported in Table 5.2 with marginal differences. As illustrated in Table 5.33, the symbol (✓) is applied to indicate that the specific research issue was defined, applied, tested and/or validated, whereas, symbol (×) is applied where a specific research issue is not validated. For example the differences between the two case studies in *research issue 1* is that for case study in CICTD, two factors were not validated whereas, in CSD one factor was not validated as highlighted in Table 5.33. The remaining factors are validated through both the case studies. This validation of factors influencing EAI adoption through empirical research supports the literature findings for the factors as proposed in Figure 3.2. The case data from both the case studies also indicated additional findings on factors for further research (as highlighted in summary column in Table 5.33).

The difference between the two case studies in *research issue 2* is that both the case studies validated and highlighted the importance of adoption lifecycle phases (as reported in Tables 5.4 and 5.19). However, the interviewees at CICTD reported new adoption lifecycle phases as explained in Section 5.2.2.2.2 and summarised in Table 5.33. For CSD, the interviewees did not mention any new adoption lifecycle phase. For the differences in *research issues 3 and 4* between CICTD and CSD is not marginal. The reason is that interviewees in both the case studies: (a) mapped the factors on adoption lifecycle phases and (b) prioritised the importance of factors on adoption lifecycle phases, based on their understanding and observation during their respective projects. As reported earlier, detailed analysis of the results of prioritisation of factors is described in Chapter 6. In concluding the empirical findings for case organisation LGA_A, both the case studies have supported the literature findings and validated the proposed EAI adoption model in LGA_A CICTD and CSD (Figure 3.7), with revisions to the proposed EAI adoption model presented in Chapter 6.

	Research Issue		EAI Demonstration Pilot Project					e-Forms & CRM Integration Project				
			Defined	Applied	Tested	Validated	Summary	Defined	Applied	Tested	Validated	Summary
Research Issue – 1: Section 3.1.3	*Factors influencing EAI adoption in LGAs.*	PC	–	–	✓	✓	*- All factors were validated through the case study except evaluation framework and formalisation.* *- New External Pressure Factors identified e.g. stakeholders i.e. peer, residential, ICT suppliers, private sector pressure, competition.* *- New Internal Pressure Factor identified e.g. project timescale.* *- New Financial Capability Factor e.g. central government grants.*	–	–	✓	✓	*- All factors were validated through the case study except ROI.* *- New External Pressure Factor identified e.g. Stakeholder i.e. local government authority pressure to share data.* *- New Internal Pressure Factor identified e.g. top management pressure for project delivery on time.*
		CS	–	–	✓	✓		–	–	✓	✓	
		CM	–	–	✓	✓		–	–	✓	✓	
		MK	–	–	✓	✓		–	–	✓	✓	
		EF	–	–	✓	×		–	–	✓	✓	
		TR	–	–	✓	✓		–	–	✓	✓	
		ITI	–	–	✓	✓		–	–	✓	✓	
		PITK	–	–	✓	✓		–	–	✓	✓	
		ITS	–	–	✓	✓		–	–	✓	✓	
		DSP	–	–	✓	✓		–	–	✓	✓	
		TMS	–	–	✓	✓		–	–	✓	✓	
		ITS*	–	–	✓	✓		–	–	✓	✓	
		HAA	–	–	✓	✓		–	–	✓	✓	
		ROI	–	–	✓	✓		–	–	✓	×	
		C	–	–	✓	✓		–	–	✓	✓	
		C*	–	–	✓	✓		–	–	✓	✓	
		MC	–	–	✓	✓		–	–	✓	✓	
		B	–	–	✓	✓		–	–	✓	✓	
		B*	–	–	✓	✓		–	–	✓	✓	
		F	–	–	✓	×		–	–	✓	✓	
		S	–	–	✓	✓		–	–	✓	✓	
Research Issue – 2: Section 3.2	*Adoption Lifecycle Phases.*	M	–	✓	✓	✓	*- New Adoption Phases identified e.g. external driver, research and discussion phases.*	–	✓	✓	✓	–
		C	–	✓	✓	✓		–	✓	✓	✓	
		P	–	✓	✓	✓		–	✓	✓	✓	
		AD	–	✓	✓	✓		–	✓	✓	✓	
Research Issue – 3: Section 3.2.1	*Mapping EAI adoption factors on different Phases of the Adoption Lifecycle.*		–	✓	✓	✓	*- Results summarised in Tables 5.6, 5.7, 5.8 and 5.9.*	–	✓	✓	✓	*- Results summarised in Tables 5.21, 5.22, 5.23 and 5.24.*
Research Issue – 4: Section 3.3.1	*Prioritising the importance of EAI adoption factors on different Phases of the Adoption Lifecycle.*		–	✓	✓	✓	*- Results summarised in Tables 5.14, 5.15, 5.16 and 5.17.*	–	✓	✓	✓	*- Results summarised in Tables 5.29, 5.30, 5.31 and 5.32.*

Table 5.33: Main Findings from both LGA_A Projects

5.3 Case Organisation Two – LGA_B

5.3.1 Background to LGA_B

For confidentiality reasons, the researcher uses the name LGA_B to refer to the second case organisation. LGA_B is an outer London borough and is predominantly a residential area. It covers an area of 39 square kilometres, and has a population of approximately 227,000. The borough is ranked as one of the most deprived of the 354 local authorities in the UK. Unemployment stood at 4.2 per cent in December 2005, nearly twice the national average of 2.4 per cent. From the borough's own surveys the greatest concern of residents is crime and Anti Social Behaviour (ASB). There are 94,000 homes in the borough of which 75 percent are privately owned 12 percent are borough owned but managed by the borough. The borough comprises of 60 councillors with no overall control. The labour party has 27 seats, conservatives have 18 and liberal democrats have 15. Labour and liberal democrats share the governing of the borough, which has adopted the leader and cabinet model.

As a metropolitan authority, LGA_B provides the full range of local government services – including education, social services highways, libraries, environmental services and leisure – employing more than 4,300 staff in a variety of locations across the borough, and working closely with its partners in health, emergency services and the voluntary sector. LGA_B receives approximately 2000 citizen queries via telephone, whereas, face-to-face contacts are approximately from 150 on daily basis. LGA_B was assessed as a 'one-star' authority by the audit commission's Comprehensive Performance Assessment (CPA)[5] in December 2005 and judged to be improving well.

5.3.1.1 Background of LGA_B IT Infrastructure

LGA_B faced a number of challenges in meeting its internal performance targets whilst also addressing the modernising government agenda. The borough developed a number of different systems e.g. for finance, human resources, and payroll and purchasing, which were provided by different suppliers, with distinct data repositories and network infrastructures and were no longer able to meet the needs of a modern, dynamic authority. This illustrates that LGA_B's IT infrastructure has been considered as highly fragmented and outdated, with almost 100 separate IS in place. Figure 5.7 illustrates the IT infrastructure at LGA_B in 2000.

[5] – In the UK the CPA, conducted by the Audit Commission, aims to assess the performance of every local authority and the services that they provide for the local people.

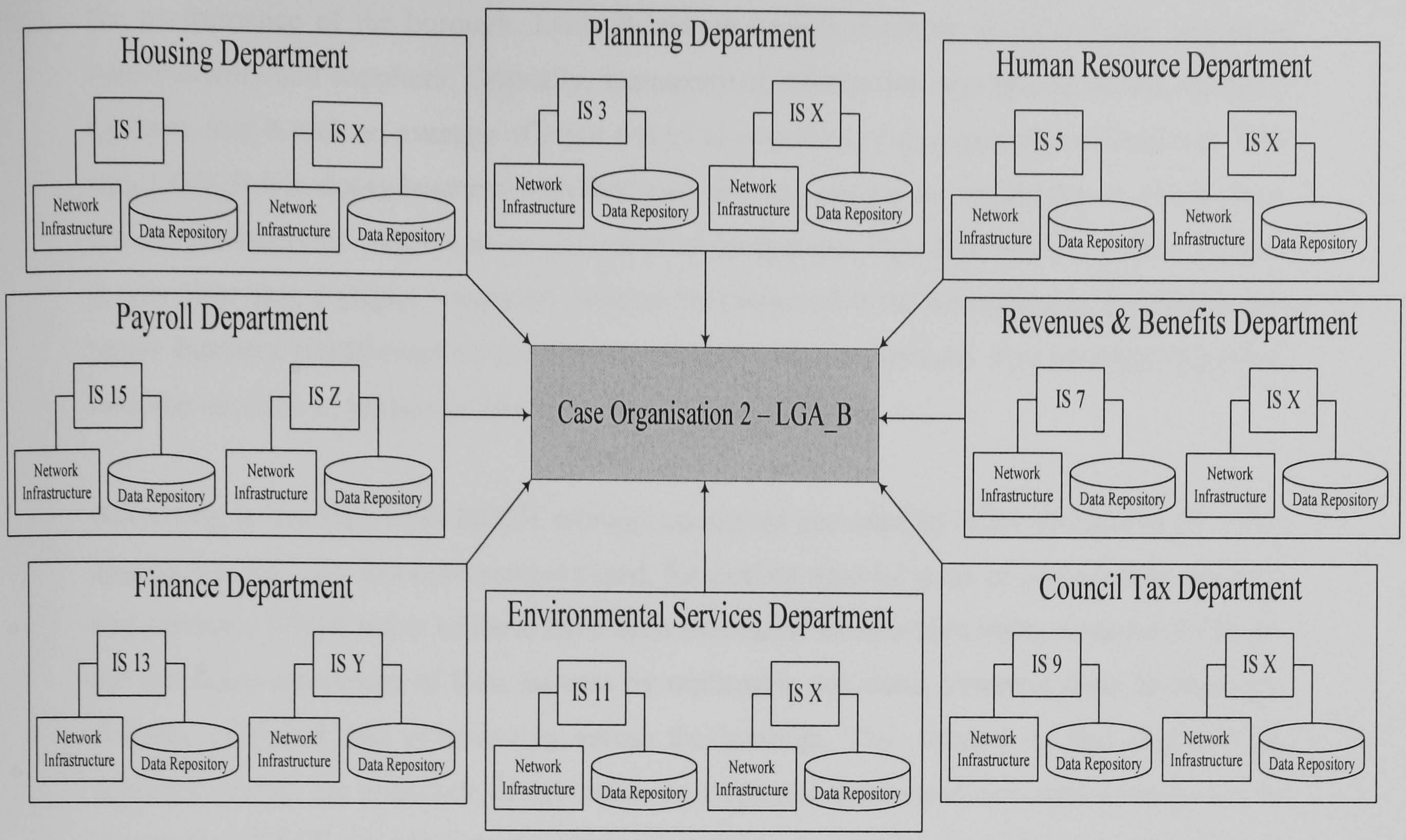

Figure 5.7: LGA_B IT Infrastructure in early 2000

The head of IT reported that:

> "... *IT infrastructure was federalised i.e. different departments with individual networks and data repositories. In addition the financial control and the actual administration were spread out among the organisation, so different parts of the organisation looked at different parts of the IT. For instance, like other departments adult services department also had their own programme of work implementing various IT systems and services* ..."

It was dependent on ageing mainframe systems that delivered neither the necessary functionality nor the capacity. In addition, the mainframe financial system could only be accessed by accountants that used it to open and close the annual accounts and complete government returns, but budget and management information was out of date and difficult to obtain. LGA_B used a general ledger system that did not address the strategic or operational management needs of the organisation. There was no strategic procurement focus and no corporate procurement system, and the whole borough did not operate a commitment accounting system.

Operational inefficiencies were prevalent and management information was late and unreliable. For example, the operational issues in procurement and finance were constraining the performance of the borough. LGA_B had no overall visibility of its budgets, payment commitments and suppliers. Critically, management information was spread across multiple systems, and it took an average of eight weeks to provide key management information. The way LGA_B was doing business with their partners was costing too much, due to which there was no productivity. There was no control over the systems from data security point of view. It was clear that a single, integrated solution was required if the borough was to achieve the major business transformation involved in modernising its services. The borough therefore took the decision to update its key corporate IT infrastructure.

According to the high level IS/ICT strategy document provided by LGA_B head of IT, their approach to delivery has been project based, focused on specific areas of work and/or systems and services. Whilst many of these have been successful in their own right, however, LGA_B did not taken advantage of their success by replicating solutions, mapping them to strategic delivery of policy and programmes across the borough. The outcome of this approach is demonstrated by the multitude of networks, desktops and database driven applications spread across the LGA_B. In addition, the corporate systems have not been considered as potential solution providers for outward facing line of business projects in the past and have been treated as traditional ICT/IS services without fully considering their potential to improve the way we work. The result has been separate implementations of systems designed to do specific tasks without relating them to the way people work. The following section demonstrates in detail on some other limitations in LGA_B IT infrastructure.

5.3.1.2 Limitations in Integrating IT Infrastructure

LGA_B departments implemented various information systems (Figure 5.7) to improve their services however, these information systems did not solve all problems and thus, prevented in overcoming the limitations of their IT infrastructure. Some of the reasons noted from the interviewees (Head of IT [HIT], Project Manager [PM] and Senior Systems Developer [SSD]) during the discussions were: (a) silo mentality, (b) disjoint working, (c) incompatible systems, (d) lack of information and (e) lack of information sharing. The researcher presents the limitations that were highlighted: (a) during the interviews, (b) from documentation provided by LGA_B officials and (c) self observations during interviews in this section and are classified in the same way as in Chapter 2.

- **ERP Systems Failures:** The interviews illustrated that there were no major failures in implementing ERP at the LGA_B. Almost all the ERP systems are outsourced to their third party partners and if any failure aroused that would be the responsibility of the third party partners involved. Though, an interviewee did say that:

> "... *ERP systems lack the ability in integrating different applications because these systems are not an integration technology but packaged systems* ..."

The head of IT reported that:

> "... *compatibility of the systems was a problem and the challenge was to build an interface between such disparate systems* ..."

In addition, ERP has been expensive due to its cost of implementation and we had to seek for expertise for its implementation and at a certain point in the past we have also realised that ERP was not efficiently providing what it was intended to do.

- **Organisational Information Sharing and IS Integration:** The interviews conducted with the head of IT, project manager and senior systems developer demonstrates that information sharing was a major problem, as all the interviewees mutually agreed that:

> "... *the way we stored information did not assist us in sharing information with other departments i.e. there was no consistency in storing data* ..."

The head of IT also reported that:

> "... *we had and still have an issue i.e. lack of a consistent method by which we can identify our citizens. This is an issue here and we are trying to employ new ways to cover up this issue. At present we identify our citizens through council tax and the electoral, so basically we need identification number for each of our community member* ..."

According to the high level IS/ICT strategy for LGA_B there is a need to make better use of data that borough collects and hold, together with the processes and underpinning technologies that transform the raw data into usable information. The reason is that making the information available centrally would allow it to be manipulated to provide timely and accurate management information on performance metrics against specified key targets. The senior systems developer highlighted here that:

"... *each department developed their own business applications based on their specific requirements and supported by hybrid arrangements with their specific software suppliers and other various third parties* ..."

This illustrates that there was no cohesion between various departmental and corporate systems and an almost complete lack of integration with delivery services and information systems.

- **Citizen Data Security and Privacy Issues:** While discussing on this issue, the head of IT replied that:

"... *concerns over citizen data security and privacy have certainly been a continued problem and has been a barrier in integration* ..."

Literature indicates that integration encourages the sharing of data between government agencies (Gil-García *et al.,* 2005; Akbulut, 2002; Landsbergen and Wolken, 2001); however, this must be done so in a controlled and transparent manner, which protects sensitive information, and in some cases, citizen identity (Gil-García and Pardo, 2005; Wimmer and Traunmüller, 2002). Another concern here is that there is a need to be very sure that the reasons for which information is being extracted are valid reasons. So there is an element of understanding and trust between the residence and the borough. The senior systems developer and the project manager mutually agreed that:

"... *major problem arises when our staff here at the LGA_B shares citizen's data with the central local government because this may increase the distrust among the citizens and the council* ..."

- **Business Process Reengineering in e-Government Projects:** In the last 3-4 years, there was too much emphasis on e-enabling everything and not enough emphasis on targeting what services would best benefit for the organisation to provide to our community. In addition, the prioritisation of e-Government services has been very limited, based more around the ability to deliver the project within a given timescale and whether resources are in place or not. The interviewees mutually agreed that:

"... *there was no clear link to the priorities of this borough i.e. building capacity and partnerships to deliver excellent services, no business process reengineering* ..."

However, currently LGA_B is certainly thinking in that direction and looking to invest in technology only where there is a good business case for it.

- **Front-Office/Back-Office Operations and Functioning:** The interview discussions on front-office/back-office operations and functioning with the head of IT and the project manager illustrates that

> "... *IT service provision was dispersed across the whole of the borough and being supported by a variety of third party suppliers providing IT desktop and infrastructure services across a range of local networks. The front and back office operations were not integrated because the inherent design of many back office legacy applications was as standalone, typically mainframe-based applications, rather than as network integrated applications* ..."

Furthermore, the senior systems developer highlighted some technical factors, which made it difficult for them to integrate legacy application:

> "... *the technical factors were lack of published APIs, aging file formats and limitations in network connectivity. There was a need for integration across the borough and anticipate greater use of virtual teams drawn from different business areas both internally and with external stakeholders, to aid better delivery and decision-making* ..."

- **Support Management and Decision Making Process:**

The interviewees also illustrated that the limitations of LGA_B IT infrastructure (Figures 5.7) caused problems for the management in their decision making process. For example, the head of IT reported that:

> "... *since multiple information systems store data for the same entity, management could not retrieve the most updated data for the entity and therefore faced problems in decision-making process* ..."

IT infrastructure could not efficiently support core business processes therefore, became an obstacle for achieving their service delivery targets. There was a need for better collaboration among partners by integrating IT infrastructure and to integrate legacy systems to improve coordination and relationships among the departments.

Clearly, the findings on the background to LGA_B IT infrastructure indicate that there was a negative impact on the delivery of services to citizens. All the limitations are summarised in Table 5.34.

Integration Drivers	LGA_B Limitations
ERP Systems Failures:	• ERP cannot integrate interfaces between different applications. • ERP is not efficient and expensive due to its cost and expertise required for to implement it.
Organisational Information Sharing and IS Integration:	• No consistency in storing data. • Each department developed their own business applications with specific requirements and supported by hybrid arrangements with their specific software suppliers and other various third parties.
Citizen Data Security and Privacy Issues:	• Sharing of data in a controlled and transparent manner. • Lack of trust/understanding on data security and privacy issue when sharing data between the LGA_B and the central government.
BPR in e-Government Projects:	• No emphasis of business process reengineering. • Prioritising e-Government services has been very limited. • There was no clear link to the priorities of this borough.
Front-Office/Back-Office Operations and Functioning:	• The front and back office operations were not integrated. • Lack of published APIs, aging file formats and limitations in network connectivity.
Financial Issues in Implementing Integrated e-Government:	–
Supporting Management and Decision Making Process:	• IT infrastructure could not efficiently support the decision making process in management. • The inability due to IT infrastructure limitations to provide data accuracy causes problems in decision-making.

Table 5.34: LGA_B – IT Infrastructure Limitations

It appears from the interviews that the limitations of IT infrastructures presented in Section 2.2 are validated since similar views were shared by the interviewees in this case study. However, the results motivated the LGA_B officials to take the decision for EAI adoption for developing integrated IT infrastructure.

5.3.1.3 Motivations for EAI Adoption

The aforesaid background on IT infrastructure limitations, illustrates that in early 2000, LGA_B has been attempting to promote and drive work aimed at delivering against the 2005 e-Government targets by focusing on how LGA_B utilises IT to improve their specific processes. Rather than examining what LGA_B is here to deliver and how IT can transform the business to improve the quality whilst improving efficiency. Similarly, LGA_B's corporate IS/IT delivery has been federal, with HR, finance, the delivery directorates, revenues and benefits and other departments each taking forward their own programmes of work implementing various IT applications and services.

In both aforesaid cases, LGA_B's historical approach to delivery has been project based, focused on specific areas of work and/or systems and services. Whilst many of these have been successful in their own right, LGA_B has not taken advantage of their success across the borough. The outcome of this approach is perhaps best demonstrated by the multitude of networks, desktops and database driven applications spread across the LGA_B. Corporate systems have not been considered as potential solution providers for outward facing line of business projects in the past and have been treated as traditional IS/IT services without fully considering their potential to improve the way LGA_B works. The result has been separate implementation of information systems designed to do specific tasks without relating them to the way people work. Examples include among others: the Virtual Private Network (VPN) solutions across the borough.

IT service provision is still dispersed across the borough and being supported by a variety of third party suppliers e.g. (a) one supplier providing ICT desktop and infrastructure services across a range of local networks, (b) another supplier providing project support and management across the rest of the borough alongside third party support being procured on an individual basis by business units, (c) corporate services strategy and resources providing SAP support and supplier management under the partnership agreement with another supplier, (d) each directorate developing their own business applications based on their specific requirements, (e) portfolio services providing accommodation, (f) HR driving employee self service through SAP and the shared service centre. All the aforementioned limitations in IT infrastructure and issues motivated LGA_B decision makers to take a decision to significantly enhance their service delivery by adopting EAI technological solution to develop an integrated IT infrastructure.

5.3.1.4 EAI Adoption Process

LGA_B considers that it was a big challenge to bring together all departments and their IS and fully automate the borough. At the end of 2001, the corporate IT department started examining available solutions to meet the challenge for developing a standardised, flexible, integrated and homogeneous IT architecture. The pressure for meeting the 2005 e-Government target was also mounting. In doing so, the corporate IT department, followed their government standard project and program management methodology to determine whether EAI was cost effective or not, despite lack of in-depth knowledge on EAI. The head of IT reported the reason that:

"... *it was important to understand the business needs of LGA_B rather than only looking at the technology* ..."

Thus, LGA_B adhered to the following formalised steps: (a) initially, LGA_B identified the business definition i.e. understanding precisely what is it that we want to achieve in the output by adopting a EAI, (b) once the business needs were identified, LGA_B than looked at EAI technology landscape to facilitate that business need, (c) defining how that EAI technology can help meet that business need and (d) only at this point do the borough then apply whether their organisational infrastructure has a solution to meet that business needs or not. Then LGA_B prepared few feasibility studies based on the capabilities of their IT infrastructure, available integration technologies and an evaluation process for selecting integration solution suppliers. On reviewing the aforesaid studies, LGA_B took the decision to employ EAI as the core architecture. The decision makers asserted that EAI may represent a significant integration tool for developing a manageable and homogeneous IT infrastructure. This whole process illustrates that LGA_B followed a formalised procedure in understanding and analysing the business needs of LGA_B and thus, selecting EAI.

It also appears that IT sophistication influences the decision to adopt EAI technology. However, LGA_B did not take the decision to fully integrate the borough since such a solution had a high cost. This also indicates that cost factors also influence the decision for introducing EAI. In 2002, having decided to adopt EAI solution, the borough short-listed few integration solution suppliers. A rigorous evaluation process and site visits to suppliers, borough thought that only CompuSoft-4 (for confidentiality the researcher has coded the supplier names as CompuSoft-1...ComputSoft-6) could meet its requirements for a corporate information system. CompuSoft-4 was selected as implementation partner for a managed service to deliver end-to-end solution from back office through to customer-facing services. Figure 5.8 depicts the overall current borough business architecture for Electronic Document and Records Management (EDRM) with EAI is at the core of this architecture.

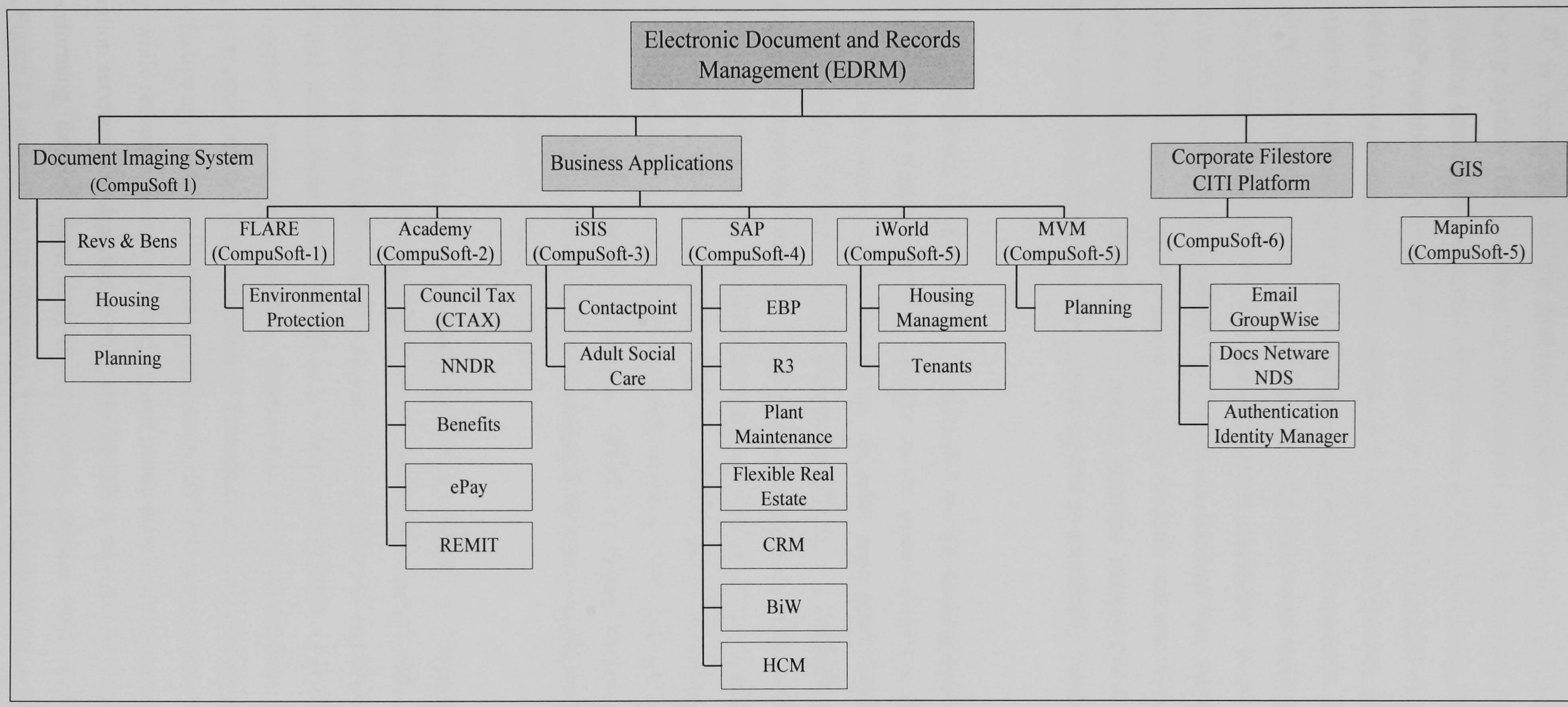

Figure 5.8: LGA_B Business Architecture for EDRM

The head of IT is responsible for the business architecture. Figure 5.8 illustrates that Document Imaging System (DIS) supplied by CompuSoft-1 is an IT category for systems capable of replicating documents commonly used in business. LGA_B is using DIS to store the data from SAP (supplied by CompuSoft-4) modules and all staff's personal records. So at the technical level EAI was adopted to piece together DIS with its SAP business application. Thus, DIS is used for scanning, digitising and storing the data from SAP modules. DIS is also integrated with Revenues and Benefits, Housing and Planning department applications with their EAI infrastructure. For example, business application 'Academy' is provided by ComputSoft-2 for the Revs & Bens department for council tax, National Non- Domestic Rate (NNDR) and benefits. Academy delivers tangible benefits for both staff and citizens via an integrated portfolio of software modules. The system provides comprehensive revenues capability, performance monitoring and management control to specifically enhance citizen care.

Business application 'iWorld' is provided by CompuSoft-5 for the housing department for housing management and tenants data. This systems covers several areas e.g. allocations, asset planning, rents and arrears, service charges etc. Business application 'MVM' is also provided by CompuSoft-5 for the planning department. MVM is a business processing systems designed to support the work of LGA_B planning department officers. It provides informative, relevant and up to date planning information to the public in a convenient and accessible format. A range of business applications for 'SAP' supplied by CompuSoft-4 for EBP, R3, plant maintenance modules flexible real estate modules, CRM, Business Intelligence Warehouse (BiW), and Human Capital Management (HCM) i.e. human resource modules, payroll and procurement. SAP's HCM and DIS integration is the most current project LGA_B is working on and is described in the next section.

Other business applications i.e. 'iSIS' by CompuSoft-3 and 'FLARE' by CompuSoft-1 are standalone integrated systems. For example, iSIS is a framework for working with children in need and their families and handling large amounts of information on individual children (contactpoint) and adult social care. FLARE is an integrated solution with all facilities required to improve regulatory inspection, enforcement and administration related to environment. Corporate filestore is the Corporate IT Infrastructure (CITI) by CompuSoft-6. It provides an effective approach to collaboration services to CITI that delivers security, control and mobility, while reducing the cost of managing and maintaining essential communication and collaboration services with departments. MapInfo for GIS is provided by CopuSoft-5. It helps in performing detailed data analysis to improve service with location-based intelligence. Figure 5.9 summarises the integration in the business applications architecture.

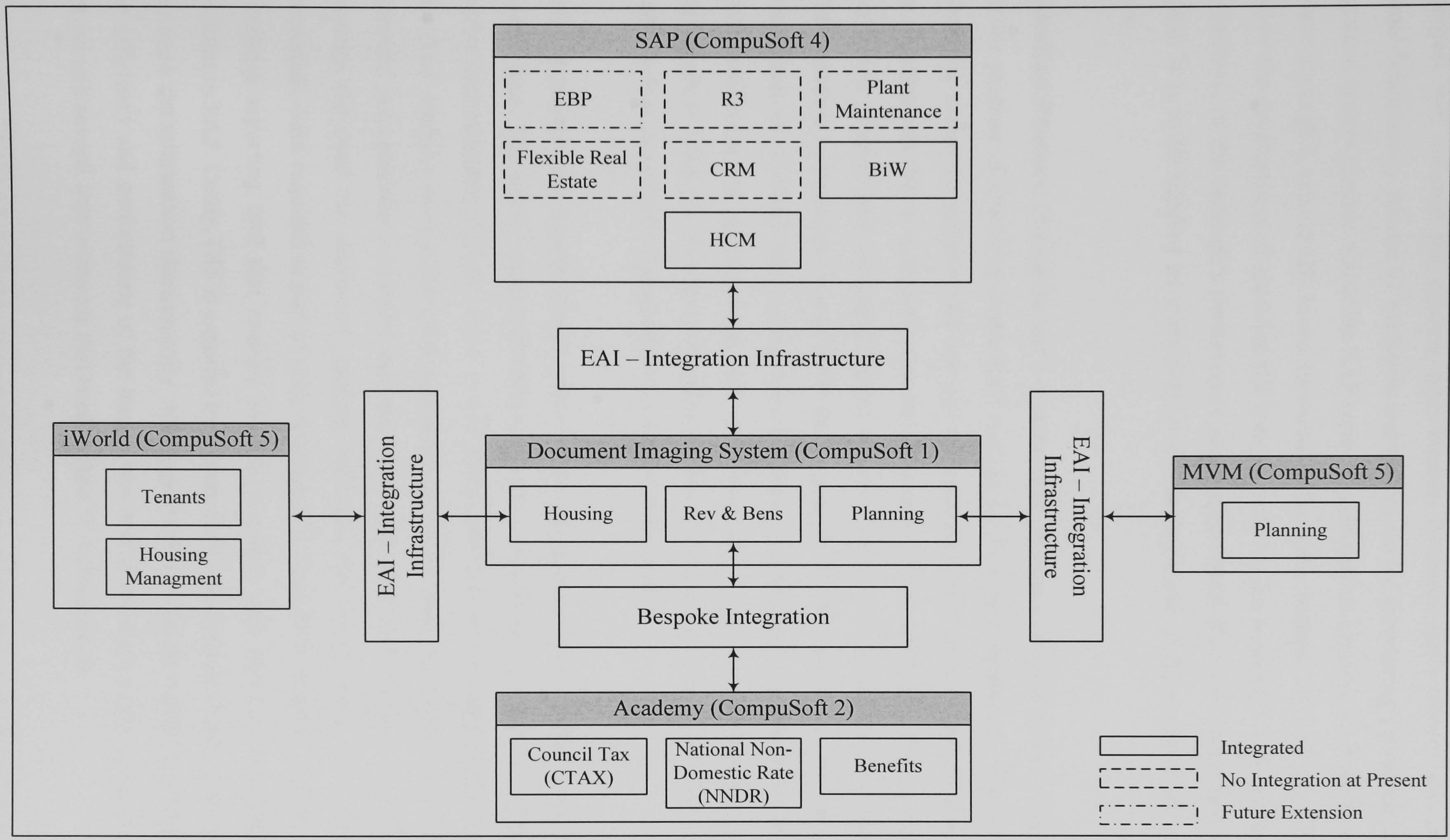

Figure 5.9: Integration at LGA_B

5.3.2 EAI Adoption in LGA_B – DIS and SAP Integration Project

This project will enhance the existing SAP Human Resource (HR) system and provide additional functionality for use by managers and employees by introducing the human capital management system module within the SAP series of information systems. SAP HCM is used to replace borough's smaller HR based solutions in the early versions of SAP i.e. R3. This may allow the development of specified HR enhancements to the borough's SAP HR module in the interests of the borough's performance and improvement plan and vision and values statement. It is to be adopted by everybody in the borough and is the standard for all HR services.

- **Selection Process:** During the last 3-4 years, LGA_B interacted with different suppliers for the purpose of procuring a new SAP module for their HR department. The borough wanted to assess the supplier that can provide most cost-effective solution and that meet its requirements for a corporate information system within LGA_B. After a rigorous evaluation process and visiting different selected supplier's clients, LGA_B selected CompuSoft-4 to introduce a new SAP HCM module. HCM module covers personnel administration, of which much of the documentation is in hard copy (references, copies of birth certificates and qualifications, sick certificates and so on related to managers and employees in LGA_B). Similarly, Supplier Relationship Management (SRM formerly as EBP) system supplied by CompuSoft-4 is another SAP module.

  LGA_B project team intends to commence on the integration of this module with DIS in a years time. The link between SAP SRM and DIS is with the procurement i.e. where the source documentation will be stored in SAP SRM and DIS will be required for some of that. SAP modules such as R3, plant maintenance, flexible real estate and CRM systems currently are standalone systems and not integrated with DIS because they do not generate the need for document imaging, although that could change if hard copy documents were required as part of their functionality. Last SAP module i.e. BiW is an enterprise reporting tool that enables to built enquiries and reports across different modules in SAP. Lastly, DIS is supplied by CompuSoft-1 that enables LGA_B to digitise and store the information electronically. Although the SAP's HCM module has improved the efficiency and performance of the human resource department at the LGA_B, there are yet still several improvements that need to their IT infrastructure.

- **Integration Approach:** LGA_B took the decision to integrate its SAP HCM module (by CompuSoft-4) with the DIS (by ComputSoft-1) using EAI architectures and technologies. Since CompusSoft-1 also provides EAI solutions, LGA_B decided to collaborate with CompusSoft-1 and integrate its DIS with SAP's HCM module. This integration did not include any other SAP module. This integration approach illustrates that LGA_B does not follow a strategic adoption of EAI but an opportunistic one and seeks to overcome point problems to improve key business processes. The interviewees mutually emphasised that:

> "... *this is the best way to implement a small integrated infrastructure in our human resource department. Based on the evaluation of this project we can expand it in the future for other SAP modules* ..."

The project manager and senior systems developer mutually agreed that:

> "... *we followed the suggestions of CompuSoft-1 to integrated with CompuSoft-4 SAP HCM module, as there was lack of EAI knowledge and skills even at the managerial level within the borough, thus, we relied on CompuSoft-1* ..."

- **DIS and SAP Integration Project:** The DIS and SAP's HCM module is an integration project within the LGA_B where an integrated solution is being developed to provide multi-LGA access and sharing of information for the employees and managers in the human resource department. This project aims to achieve the following: (a) modernise the HR information system and improve efficiency and effectiveness of staff, managers and HR professionals, (b) to enable managers to access the information they need in a more user-friendly environment, (c) to improve data accuracy, especially absence recording, (d) improve and speed up the recruitment process, (e) to reduce workload and deliver efficiency savings and (f) enable employees to do a whole lot more themselves.

- **The Solution:** The need for integration is to provide real time information for all employees and managers. Integration of DIS with SAP modules was assisted by their existing supplier CompuSoft-1 i.e. CompuSoft-1 supplied the required expertise for integrating SAP modules with DIS by providing the core EAI infrastructure. In doing so, CompuSoft-1 provided EAI based message oriented XML enabled e-GIF (e-Government Interoperability Framework) compliant interface that integrates DIS and SAP modules (Figure 5.10). Whereas, while none explicitly BiW is for reporting, then DIS allows capturing and storing hard copy information electronically. However, while implicitly, if documents are digitised via DIS then BiW can be used to enquire against them.

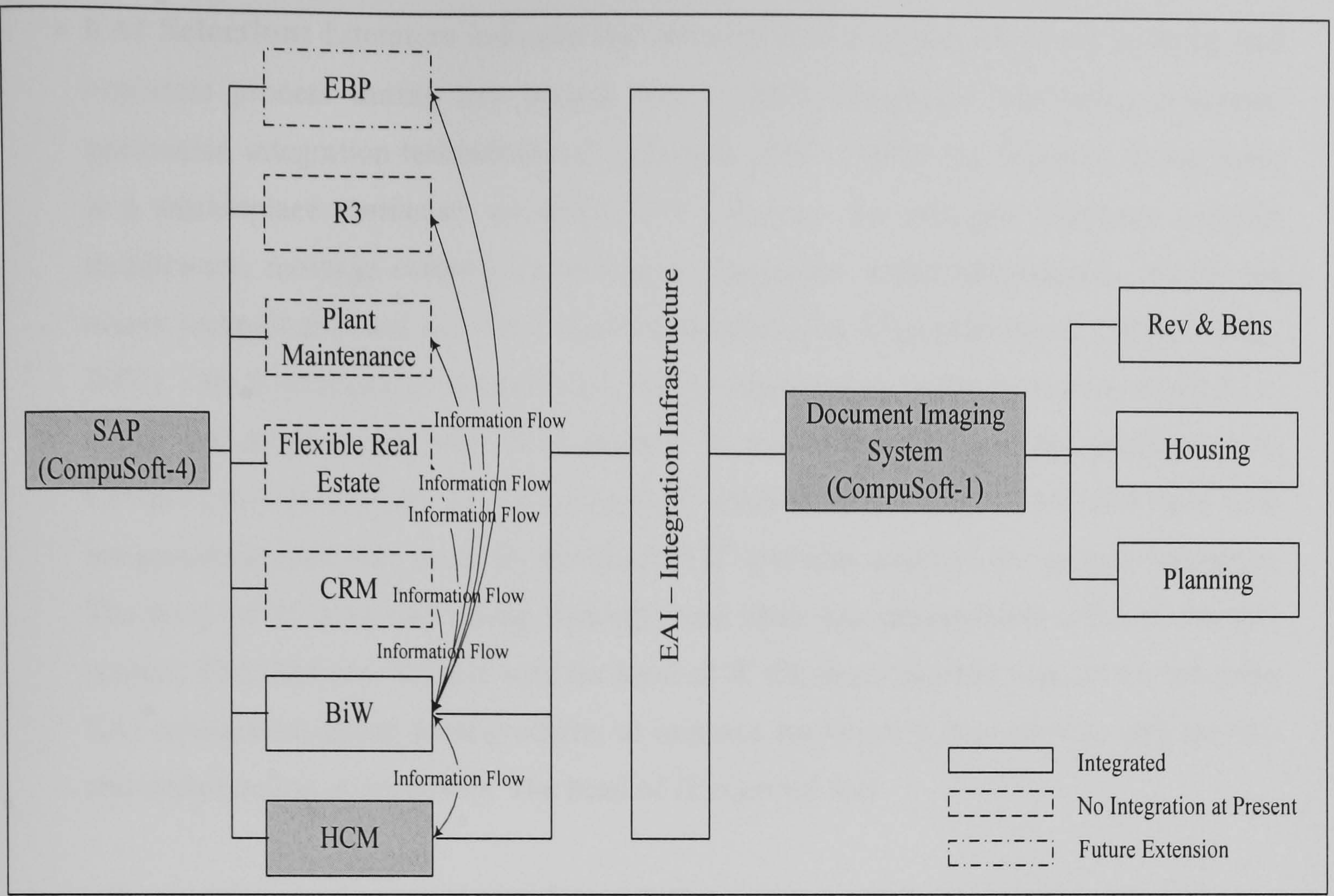

Figure 5.10: DIS and SAP Integration Project

With the introduction and integration of SAP HCM module, LGA_B was able to reengineer several business processes e.g. (a) submission of absence forms were directly recorded into the system rather than submitting paper documents, (b) annual leave cards were discarded as SAP HCM made them available, (c) changes in data were no longer amended through paper documents, as employees and manager having access to the system self service facility were able to do it through SAP HCM. In case of ROI, the head of IT reported that:

"... *ROI is purely about how long it will take to cover up that cost. We are expected to achieve a full payback in four years time in monitory terms, whereas good services is added value and but if the project cannot delivery ROI in 4 years then it is unlikely to proceed* ..."

5.3.2.1 Findings on the DIS and SAP Integration Project

The main issues derived from the DIS and SAP integration project presented earlier are summarised and described below along with the comments from the interviewees:

- **EAI Selection:** Literature indicates that the selection of EAI solution is a complex and important process during any project that involves integration employing enterprise application integration technologies (Linthicum, 2000; 1999). The rationale is that there is a marketplace confusion regarding EAI solutions, for example: database oriented middleware, message oriented technologies, transaction based technologies, distributed object technologies and interface oriented technologies (Themistocleous, 2004; Serian, 2002). Due to plethora of technologies, many organisations spend time and resources to assess and choose appropriate EAI solution. In this case study, the final decision (with CompuSoft-4 assistance) for selecting EAI solution as a core for the DIS and SAP integration project was made by the head of IT and also acted as the project champion. The head of IT also had strong backing from other top management officials for this project. The interview session with the head of IT illustrated several reasons for selecting EAI solution including among others: to improve employee's data security and privacy and departmental productivity. The head of IT reported that:

  "*... we did not have any control on our legacy HR systems for security point of view and no security of information and no seamless access to information. Due to this there was not HR departmental productivity ...*"

  Themistocleous *et al.,* (2004) proposed two evaluation frameworks, which can be used by organisations to assess EAI packages and technologies. In this case study, the LGA_B did not use any of these frameworks or other tools to assess EAI solution. The reasoning for this decision is that the case organisation lacks of knowledge on EAI area and thus took the decision to fully trust on CompuSoft-1. Although, this decision illustrates a high risk, however, on inquiring the interviewees mutually agreed that:

  "*... we did not face any risks for relying on CompuSoft-1 for the EAI solution, as we selected CompuSoft-1 for the DIS and SAP integration project after a rigorous search and evaluation of integration solution suppliers... in addition, we relied on CompuSoft-1 as they had great experience on IT projects and clear view regarding the integration of EAI solutions ...*"

  The discussions illustrate that LGA_B did not face any risks while adopting EAI. The reason is that EAI solution was provided by their existing supplier CompuSoft-1 who has assisted them in several other projects. The solution was simple, thus, in this case, LGA_B relied on the expertise of their supplier for EAI solution. Another factor not validated is the critical mass. An explanation for 'critical mass' is that LGA_B regarded themselves as front runners among the other London boroughs in terms of adopting technologies. The head of IT reported that:

> "... *we have an alliance with other boroughs but we consider ourselves as front runners in area of integration/IT solutions, thus, we follow a proactive approach while adopting IT solutions and aim to be the leaders in what we do* ..."

- **EAI Adoption:** The researcher also proposed several other factors influencing EAI adoption (in Figure 3.2). Among the remaining factors only citizen satisfaction factor was not validated through this case study. The reason is that this case study is based on the integration of modules directly related to the HR department and its staff not the citizens. Several EAI benefits were identified and the researcher asked the interviewees to rank them (as reported in Appendix C). As reported earlier, the adoption of EAI has its own barriers. In the case of LGA_B, *barriers* extracted including among others: (a) no evaluation frameworks used to assess EAI solution, (b) lack of EAI knowledge, (c) low level of LGA_B IT infrastructure. Detailed analyses of other barriers extracted by observation and discussions during the DIS and SAP integration project are presented in Appendix C.

- **Project Implementation:** The HCM module implementation within this project includes functionalities relating to Employee Self Service (ESS) provides employees who have regular access to a Personal Computer (PC) with a method of viewing and updating their own HR information via a secure password into SAP. As an employee, staff members will be able to e.g.: (a) view and update personal data, such as address details, bank information and diversity data, (b) request annual leave and special leave – these requests will be work flowed through to their manager for approval and (c) view their annual leave entitlement and balance throughout the leave year. Whereas, Managers Self Service (MSS) will enable managers to view relevant details for staff they have management responsibility for.

  As a manager within LGA_B they will be able to: (a) view appropriate human resource information that is required for their management role, (b) have access to improved human resource reports and (c) have a team calendar view that will provide them with an overview of employees for whom they have responsibility. The functionalities illustrate that HCM implementation significantly improved the efficiencies across HR department. Real-time access to information has improved the efficiency and management of LGA_B activities and managers can easily monitor reports. Elected councillors now have accurate and up-to-date information on the LGA_B performance on which to base their decisions about service delivery. The overall project implementation has significantly reduced the number of different IT systems accessed by LGA_B staff within HR, reducing duplication of effort and information discrepancies.

5.3.2.2 LGA_B – Analysing the Issues under Research

To test the conceptual model for EAI adoption in LGAs (presented in Figure 3.7), the researcher follows the research issues as summarised in Table 5.2 and analyses these research issues in the following sections.

5.3.2.2.1 Testing Research Issue 1: Factors Influencing EAI Adoption in LGAs

The head of IT, project manager and the senior systems developer were asked to comment on the importance and the involvement of EAI adoption factors based on the DIS and SAP integration project. Table 5.35 provides with the analysis of the factors based on the views from the interviewees.

	Factors Influencing EAI Adoption	HIT	PM	SSD
PF	Project Champion	●	●	●
PF	Citizen's Satisfaction	○	○	○
PF	Critical Mass	○	○	⦿
PF	Market knowledge	●	●	●
TF	Evaluation Frameworks	⦿	⦿	⦿
TF	Technological Risks	○	○	○
TF	IT Infrastructure	●	●	●
TF	Personnel IT Knowledge	●	●	●
TF	IT Sophistication	⦿	●	●
TF	Data Security and Privacy	●	●	●
SF	Top Management Support	●	●	●
SF	IT Support	●	●	●
SF	Higher Administrative Authority	●	⦿	●
FF	Return on Investment	●	●	⦿
FF	Cost	●	●	●
OF	Centralisation	●	●	●
OF	Managerial Capability	●	●	●
OF	Barriers	⦿	●	●
OF	Benefits	●	●	●
OF	Formalisation	⦿	●	●
OF	Size	●	⦿	⦿

Table 5.35: Validation of Factors Influencing EAI Adoption in LGA_B

Table 5.35 depicts mixed results on the importance of factors influencing EAI adoption. However, with the conformity of these factors with moderate and high importance, the researcher asserts that the proposed factors (in Figure 3.2) are validated through the DIS and

SAP integration project and fulfilling the *second objective* (Section 1.3) of this thesis. Results demonstrated in Tables 5.3 and 5.18 (in the previous two case studies) and Table 5.35 in this case study; have further strengthened the researcher's justification on the importance and involvement of EAI adoption factors through LGA_B case organisation, however, with marginal differences with the previous two case studies. In the subsequent sections, the researcher presents detailed analysis of the importance of EAI adoption factors.

5.3.2.2.2 Testing Research Issue 2: Adoption Lifecycle Phases

The head of IT, project manager and the senior systems developer were asked to comment and illustrate the importance of the adoption lifecycle phases based on the DIS and SAP integration project. The interviewees agreed that in LGA_B we have come across these phases for the project. For example, the head of IT and the project manager mutually agreed that:

> "... *motivation is developing a business case i.e. when we identified our business needs, conception is the phase where we determined the technology and platform for us to go forward, proposal is the phase where we made a formal case for EAI adoption and forward it to the decision makers and adoption decision is the phase what we actually call as the investment phase, we took the decision and signed the contract with the solution provider. Thus, it does reflect the adoption phases for DIS and SAP integration project* ..."

The senior systems developer also further added that:

> "... *I consider them as fair adoption lifecycle phase's pattern and it does illustrate the adoption processes for the DIS and SAP integration project at LGA_B* ..."

Thereafter, the interviewees were also asked to illustrate the importance of the adoption lifecycle phases. The importance of each phase is presented in Table 5.36.

Adoption Lifecycle Phases	HIT	PM	SSD
Motivation	●	●	⊙
Conception	●	●	●
Proposal	●	●	●
Adoption Decision	●	●	●

Table 5.36: Importance of Adoption Lifecycle Phases in LGA_B

It appears from the analysis of the DIS and SAP integration project presented earlier with comments from the interviewees that the adoption lifecycle phases (Figure 3.3) are validated through this case study and fulfilling the *third objective* (Section 1.3) of this thesis. In the next section, the researcher presents the analysis of the mapping of each factor on the adoption lifecycle phases.

5.3.2.2.3 Testing Research Issue 3: Mapping EAI Adoption Factors on the Adoption Lifecycle Phases

Similar to the previous two case study, the researcher followed the same pattern and before commencing on the mapping of factors on the adoption lifecycle phases, the interviewees were explained how to perform the mapping. Thereafter, the interviewees were asked to map the factors (Figure 3.2) influencing EAI adoption on different phases of the adoption lifecycle (as reported in Table 5.37). The interviewees mapped the factors (based on their influence) on each phase of the adoption lifecycle. The last (results) column in each phase in Table 5.37 illustrates the outcome of the mapping of factors by the interviewees for the DIS and SAP integration project at LGA_B. The results highlight varied findings from the mapping of factors on each phase. Yet again this can be attributed to the understanding and observation of each interviewee during the DIS and SAP integration project.

		Motivation				Conception				Proposal				Adoption Decision			
	Factors	HIT	PM	SSD	Results	HIT	PM	SSD	Results	HIT	PM	SSD	Results	HIT	PM	SSD	Results
PF	Project Champion	✓	✓	✓	3/3	✓	✓	✓	3/3	✓	✓	✓	3/3	✓	✓	✓	3/3
	Citizen's Satisfaction	–	✓	–	1/3	–	–	–	0/3	–	–	–	0/3	–	–	–	0/3
	Critical Mass	–	✓	✓	2/3	–	✓	✓	2/3	✓	–	✓	2/3	✓	–	–	1/3
	Market Knowledge	–	✓	–	1/3	✓	✓	✓	3/3	–	–	✓	1/3	✓	–	–	1/3
TF	Evaluation Frameworks	✓	–	✓	2/3	–	–	✓	1/3	✓	✓	✓	3/3	✓	–	–	1/3
	Technological Risks	–	–	–	0/3	–	✓	✓	2/3	✓	✓	✓	3/3	–	✓	✓	2/3
	IT Infrastructure	–	–	–	0/3	✓	✓	✓	3/3	–	✓	✓	2/3	✓	✓	–	2/3
	Personnel IT Knowledge	–	✓	✓	2/3	✓	✓	✓	3/3	–	✓	✓	2/3	–	✓	–	1/3
	IT Sophistication	–	✓	✓	2/3	✓	✓	✓	3/3	–	✓	✓	2/3	✓	✓	–	2/3
	Data Security and Privacy	–	–	–	0/3	–	–	✓	1/3	✓	✓	✓	3/3	–	✓	–	1/3
SF	Top Management Support	–	–	✓	1/3	✓	✓	–	2/3	–	✓	–	1/3	✓	✓	✓	3/3
	IT Support	–	–	–	0/3	–	✓	✓	2/3	✓	✓	✓	3/3	–	–	–	0/3
	Higher Administrative Authority	✓	✓	✓	3/3	–	–	–	0/3	–	✓	✓	2/3	✓	✓	✓	3/3
FF	Return on Investment	✓	✓	✓	3/3	–	✓	–	1/3	✓	✓	✓	3/3	✓	✓	✓	3/3
	Cost	✓	–	✓	2/3	–	–	✓	1/3	✓	✓	✓	3/3	✓	✓	✓	3/3
OF	Centralisation	–	✓	–	1/3	✓	✓	✓	3/3	✓	✓	✓	3/3	✓	✓	✓	3/3
	Managerial Capability	–	–	✓	1/3	✓	✓	✓	3/3	–	✓	✓	2/3	✓	✓	–	2/3
	Barriers	✓	–	✓	2/3	–	✓	✓	2/3	✓	✓	✓	3/3	–	✓	✓	2/3
	Benefits	–	✓	✓	2/3	✓	✓	✓	3/3	–	✓	✓	2/3	✓	✓	✓	3/3
	Formalisation	–	✓	✓	2/3	✓	✓	✓	3/3	–	✓	✓	2/3	–	✓	–	1/3
	Size	✓	✓	✓	3/3	–	–	–	0/3	–	–	–	0/3	–	–	–	0/3

Table 5.37: Mapping the Factors on the Adoption Lifecycle Phases in LGA_B

The results of the mapping of factors for each phase are summarised in Tables 5.38, 5.39, 5.40 and 5.41 respectively and fulfilling the *third objective* (Section 1.3) of this thesis. The factors with less (i.e. one interviewee supporting and other two not) and no (i.e. none of the interviewees supporting) support are discarded. The reason is that these factors had less influence or did not influence on a specific phase (as reported in Table 5.37). On the other hand, factors with full (i.e. all three interviewees supporting) and moderate (i.e. two interviewees supporting and third not supporting) support (as highlighted in the last column of each phase in Table 5.37 are utilised for further empirical research.

	Motivation Phase			
	Factors	**HIT**	**PM**	**SSD**
PF	Project Champion	✓	✓	✓
	Critical Mass	–	✓	✓
TF	Evaluation Frameworks	✓	–	✓
	Personnel IT Knowledge	–	✓	✓
	IT Sophistication	–	✓	✓
SF	Higher Administrative Authority	✓	✓	✓
FF	Return on Investment	✓	✓	✓
	Cost	✓	–	✓
OF	Barriers	✓	–	✓
	Benefits	–	✓	✓
	Formalisation	–	✓	✓
	Size	✓	✓	✓

Table 5.38: Summarising the Factors with Full or Moderate Support on the Motivation Phase

	Conception Phase			
	Factors	**HIT**	**PM**	**SSD**
PF	Project Champion	✓	✓	✓
	Critical Mass	–	✓	✓
	Market Knowledge	✓	✓	✓
TF	Technological Risks	–	✓	✓
	IT Infrastructure	✓	✓	✓
	Personnel IT Knowledge	✓	✓	✓
	IT Sophistication	✓	✓	✓
SF	Top Management Support	✓	✓	–
	IT Support	–	✓	✓
OF	Centralisation	✓	✓	✓
	Managerial Capability	✓	✓	✓
	Barriers	–	✓	✓
	Benefits	✓	✓	✓
	Formalisation	✓	✓	✓

Table 5.39: Summarising the Factors with Full or Moderate Support on the Conception Phase

	Proposal Phase			
	Factors	HIT	PM	SSD
PF	Project Champion	✓	✓	✓
PF	Critical Mass	✓	–	✓
TF	Evaluation Frameworks	✓	✓	✓
TF	Technological Risks	✓	✓	✓
TF	IT Infrastructure	–	✓	✓
TF	Personnel IT Knowledge	–	✓	✓
TF	IT Sophistication	–	✓	✓
TF	Data Security and Privacy	✓	✓	✓
SF	IT Support	✓	✓	✓
SF	Higher Administrative Authority	–	✓	✓
FF	Return on Investment	✓	✓	✓
FF	Cost	✓	✓	✓
OF	Centralisation	✓	✓	✓
OF	Managerial Capability	–	✓	✓
OF	Barriers	✓	✓	✓
OF	Benefits	–	✓	✓
OF	Formalisation	–	✓	✓

Table 5.40: Summarising the Factors with Full or Moderate Support on the Proposal Phase

	Adoption Decision Phase			
	Factors	HIT	PM	SSD
PF	Project Champion	✓	✓	✓
TF	Technological Risks	–	✓	✓
TF	IT Infrastructure	✓	✓	–
TF	IT Sophistication	✓	✓	✓
SF	Top Management Support	✓	✓	✓
SF	Higher Administrative Authority	✓	✓	✓
FF	Return on Investment	✓	✓	✓
FF	Cost	✓	✓	✓
OF	Centralisation	✓	✓	✓
OF	Managerial Capability	✓	✓	–
OF	Barriers	–	✓	✓
OF	Benefits	✓	✓	✓

Table 5.41: Summarising the Factors with Full or Moderate Support on the Adoption Decision Phase

Factors with either full or moderate support (Tables 5.38, 5.39, 5.40 and 5.41) are utilised in the next section for prioritising their importance on each phase of the adoption lifecycle.

5.3.2.2.4 Testing Research Issue 4: Prioritising the Importance of EAI Adoption Factors on the Adoption Lifecycle Phases

Tables 5.3, 5.18 and 5.35 presented the importance of each factor using Miles and Huberman (1994) scale, whereas, Tables 5.5, 5.20 and 5.37 illustrate the mapping of factors on different phases of the adoption lifecycle and summarising the results in Tables 5.38, 5.39, 5.40 and 5.41 (for this case study). However, these tables do not illustrate the important of each factor on the adoption lifecycle phases. This section prioritises the importance of factor (with full and moderate support as reported in Tables 5.38, 5.39, 5.40 and 5.41) influencing EAI adoption. In order to prioritise the importance of factors, the following steps are used:

- **Step 1 – Constructing the hierarchy model:** Section 4.4.2.1 explains this step in detail.

- **Step 2 – Collecting data through pairwise comparison by interviews:** Before performing the pairwise comparisons, the interviewees were given instructions on how to conduct the comparison. The matrices corresponding to the individual pairwise prioritisation of the factors on adoption lifecycle phases is presented in Appendix D that represent the evaluation of the factors by HIT, PM and SSD.

- **Step 3 – Determining Normalised Priority (Local) Weights:** The normalised priority weights of all the factors (in a specific category) on different phases of the adoption lifecycle for HIT, PM and SSD are presented in Appendix D.

- **Step 4 – Analysing and Calculating the Priority Weights:** Based on normalised priority weights from previous tables (see Appendix C for tables from previous section), the relative priority importance of EAI adoption factors in a specific category are analysed and calculated in Tables 5.42, 5.43, 5.44 and 5.45. These priority weights are obtained by using the EC software and the conclusions drawn from them are the final results of the analysis of collective judgements provided by the panel of interviewees selected for LGA_B. The results are based on the knowledge and understanding of the factor by all the interviewees in LGA_B.

	Motivation Phase			
	Factors	**HIT**	**PM**	**SSD**
PF	Project Champion	(1) 0.0000	(1) 0.8750	(1) 0.8571
PF	Critical Mass	(1) 0.0000	(2) 0.1250	(2) 0.1428
TF	Evaluation Frameworks	(1) 0.0000	(3) 0.0000	(3) 0.0594
TF	Personnel IT Knowledge	(1) 0.0000	(2) 0.1111	(1) 0.7250
TF	IT Sophistication	(1) 0.0000	(1) 0.8889	(2) 0.2156
SF	Higher Administrative Authority	(1) 0.0000	(1) 0.0000	(1) 0.0000
FF	Return on Investment	(1) 0.8889	(1) 0.0000	(2) 0.2000
FF	Cost	(2) 0.1111	(1) 0.0000	(1) 0.8000
OF	Barriers	(1) 0.8889	(4) 0.0000	(1) 0.5718
OF	Benefits	(3) 0.0000	(1) 0.7553	(2) 0.2482
OF	Formalisation	(3) 0.0000	(2) 0.1881	(3) 0.1063
OF	Size	(2) 0.1111	(3) 0.0566	(4) 0.0735

Table 5.42: Individual Priority Weights of Factors on the Motivation Phase

	Conception Phase			
	Factors	HIT	PM	SSD
PF	Project Champion	(1) 0.8889	(1) 0.7353	(3) 0.0943
PF	Critical Mass	(3) 0.0000	(3) 0.0616	(1) 0.6714
PF	Market Knowledge	(2) 0.1111	(2) 0.2030	(2) 0.2343
TF	Technological Risks	(4) 0.0000	(3) 0.1102	(3) 0.1102
TF	IT Infrastructure	(2) 0.2156	(2) 0.2374	(4) 0.0405
TF	Personnel IT Knowledge	(3) 0.0594	(4) 0.0405	(1) 0.6117
TF	IT Sophistication	(1) 0.7250	(1) 0.6118	(2) 0.2374
SF	Top Management Support	(1) 0.0000	(1) 0.9000	(1) 0.0000
SF	IT Support	(1) 0.0000	(2) 0.1000	(1) 0.0000
OF	Centralisation	(3) 0.1102	(3) 0.1309	(4) 0.0731
OF	Managerial Capability	(4) 0.0405	(4) 0.0606	(1) 0.5105
OF	Barriers	(5) 0.0000	(5) 0.0276	(2) 0.2401
OF	Benefits	(1) 0.6118	(1) 0.5418	(3) 0.1323
OF	Formalisation	(2) 0.2374	(2) 0.2389	(5) 0.0439

Table 5.43: Individual Priority Weights of Factors on the Conception Phase

	Proposal Phase			
	Factors	HIT	PM	SSD
PF	Project Champion	(1) 0.8571	(1) 0.0000	(2) 0.1428
PF	Critical Mass	(2) 0.1428	(1) 0.0000	(1) 0.8571
TF	Evaluation Frameworks	(1) 0.7353	(1) 0.4988	(1) 0.4664
TF	Technological Risks	(2) 0.2030	(3) 0.1330	(4) 0.0821
TF	IT Infrastructure	(4) 0.0000	(4) 0.0784	(5) 0.0478
TF	Personnel IT Knowledge	(4) 0.0000	(6) 0.0238	(2) 0.2342
TF	IT Sophistication	(4) 0.0000	(2) 0.2216	(3) 0.1408
TF	Data Security and Privacy	(3) 0.0616	(5) 0.0439	(6) 0.0303
SF	IT Support	(1) 0.0000	(2) 0.0999	(1) 0.9000
SF	Higher Administrative Authority	(1) 0.0000	(1) 0.9000	(2) 0.1000
FF	Return on Investment	(1) 0.8889	(1) 0.8889	(2) 0.1428
FF	Cost	(2) 0.1111	(2) 0.1111	(1) 0.8571
OF	Centralisation	(1) 0.8333	(4) 0.0677	(4) 0.0659
OF	Managerial Capability	(3) 0.0000	(3) 0.1304	(1) 0.5399
OF	Barriers	(2) 0.1667	(5) 0.0309	(2) 0.2373
OF	Benefits	(3) 0.0000	(1) 0.5323	(3) 0.1295
OF	Formalisation	(3) 0.0000	(2) 0.2385	(5) 0.0271

Table 5.44: Individual Priority Weights of Factors on the Proposal Phase

	Adoption Decision Phase			
	Factors	HIT	PM	SSD
PF	Project Champion	(1) 0.0000	(1) 0.0000	(1) 0.0000
TF	Technological Risks	(3) 0.0000	(2) 0.2207	(1) 0.8000
TF	IT Infrastructure	(2) 0.1428	(3) 0.0676	(3) 0.0000
TF	IT Sophistication	(1) 0.8571	(1) 0.7116	(2) 0.2000
SF	Top Management Support	(1) 0.9000	(1) 0.9000	(2) 0.1000
SF	Higher Administrative Authority	(2) 0.1000	(2) 0.1000	(1) 0.9000
FF	Return on Investment	(1) 0.9000	(1) 0.9000	(2) 0.1111
FF	Cost	(2) 0.0999	(2) 0.1000	(1) 0.8890
OF	Centralisation	(3) 0.0546	(3) 0.1001	(3) 0.0943
OF	Managerial Capability	(2) 0.2004	(2) 0.2386	(4) 0.0000
OF	Barriers	(4) 0.0000	(4) 0.0366	(2) 0.2343
OF	Benefits	(1) 0.7449	(1) 0.6246	(1) 0.6714

Table 5.45: Individual Priority Weights of Factors on the Adoption Decision Phase

Tables 5.46, 5.47, 5.48 and 5.49 illustrate the global weights-based prioritisation of factors on the adoption lifecycle phases. They have been calculated by aggregating the values of each factor and dividing the results by the number of interviewees. The results presented in these tables do not mean that any factor is unimportant. It shows the interviewees' perceptions about the importance of the factors on the adoption lifecycle phases.

Prioritising the Importance of Factors on the Motivation Phase		
Factor Categories	**Factors**	**Prioritisation Result**
Pressure Factor	Project Champion	(1) 0.5774
Organisational Factor	Barriers	(2) 0.4869
Technological Factor	IT Sophistication	(3) 0.3682
Financial Factor	Return on Investment	(4) 0.3629
Organisational Factor	Benefits	(5) 0.3345
Financial Factor	Cost	(6) 0.3037
Technological Factor	Personnel IT Knowledge	(7) 0.2787
Organisational Factor	Formalisation	(8) 0.0981
Pressure Factor	Critical Mass	(9) 0.0893
Organisational Factor	Size	(10) 0.0804
Technological Factor	Evaluation Frameworks	(11) 0.0198
Support Factor	Higher Administrative Authority	(12) 0.0000

Table 5.46: Prioritising the Importance of Factors on the Motivation Phase

Prioritising the Importance of Factors on the Conception Phase		
Factor Categories	**Factors**	**Prioritisation Result**
Pressure Factor	Project Champion	(1) 0.5728
Technological Factor	IT Sophistication	(2) 0.5247
Organisational Factor	Benefits	(3) 0.4286
Support Factor	Top Management Support	(4) 0.3000
Pressure Factor	Critical Mass	(5) 0.2443
Technological Factor	Personnel IT Knowledge	(6) 0.2372
Organisational Factor	Managerial Capability	(7) 0.2039
Pressure Factor	Market Knowledge	(8) 0.1828
Organisational Factor	Formalisation	(9) 0.1734
Technological Factor	IT Infrastructure	(10) 0.1645
Organisational Factor	Centralisation	(11) 0.1047
Organisational Factor	Barriers	(12) 0.0892
Technological Factor	Technological Risks	(13) 0.0735
Support Factor	IT Support	(14) 0.0333

Table 5.47: Prioritising the Importance of Factors on the Conception Phase

Prioritising the Importance of Factors on the Proposal Phase		
Factor Categories	**Factors**	**Prioritisation Result**
Financial Factor	Return on Investment	(1) 0.6402
Technological Factor	Evaluation Frameworks	(2) 0.5668
Financial Factor	Cost	(3) 0.3598
Pressure Factor	Project Champion	(4) 0.3333
Pressure Factor	Critical Mass	(4) 0.3333
Support Factor	IT Support	(4) 0.3333
Support Factor	Higher Administrative Authority	(4) 0.3333
Organisational Factor	Centralisation	(5) 0.3223
Organisational Factor	Managerial Capability	(6) 0.2234
Organisational Factor	Benefits	(7) 0.2206
Organisational Factor	Barriers	(8) 0.1449
Technological Factor	Technological Risks	(9) 0.1394
Technological Factor	IT Sophistication	(10) 0.1208
Organisational Factor	Formalisation	(11) 0.0885
Technological Factor	Personnel IT Knowledge	(12) 0.0860
Technological Factor	Data Security and Privacy	(13) 0.0453
Technological Factor	IT Infrastructure	(14) 0.0421

Table 5.48: Prioritising the Importance of Factors on the Proposal Phase

Prioritising the Importance of Factors on the Adoption Decision Phase		
Factor Categories	**Factors**	**Prioritisation Result**
Organisational Factor	Benefits	(1) 0.6803
Financial Factor	Return on Investment	(2) 0.6370
Support Factor	Top Management Support	(3) 0.6333
Technological Factor	IT Sophistication	(4) 0.5896
Support Factor	Higher Administrative Authority	(5) 0.3667
Financial Factor	Cost	(6) 0.3630
Technological Factor	Technological Risks	(7) 0.3402
Organisational Factor	Managerial Capability	(8) 0.1463
Organisational Factor	Barriers	(9) 0.0903
Organisational Factor	Centralisation	(10) 0.0830
Technological Factor	IT Infrastructure	(11) 0.0701
Pressure Factor	Project Champion	(12) 0.0000

Table 5.49: Prioritising the Importance of Factors on the Adoption Decision Phase

According to the empirical findings in this case study, three factors were not validated i.e. citizen satisfaction, critical mass and technological risks. For the reason as reported earlier in Section 5.3.2 by the interviewee are: (a) because this project is related to human resource department employees and staff, for this reason citizen satisfaction factor was not validated, (b) LGA_B consider themselves as front runners, thus do not look at what other local authorities do, thus this factor was not validated and (c) according to the head of IT, they did not realise any EAI technological risks, therefore, this factor was also not validated. Other factors have either directly or indirectly influenced the decision making process for EAI technological solution adoption. The mapping of factors reported in Tables 5.38, 5.39, 5.40 and 5.41 are associated with the prioritisation results reported in Tables 5.46, 5.47, 5.48 and 5.49. Each factor mapped on each phase in Step 3, was prioritised based on its importance in that phase in Step 4. Detailed analysis of the prioritisation results is reported in Chapter 6, while revising the factors influencing EAI adoption at LGA_B.

5.3.3 Summarising the Findings Obtained from LGA_B Project

The empirical findings illustrated in Section 5.3.2 indicate that the proposed conceptual model (Figure 3.7) can be used for improving the decision making process for EAI adoption in LGAs. The rationale is that the case study presented for LGA_B has validated the research issues reported in Table 5.2 with marginal differences from LGA_A CICTD and CSD. Similar to the previous two case studies for *research issue 1*, this case study further strengthens the researchers' literature findings (factors proposed in Figure 3.2) by validating the factors influencing EAI adoption through empirical research (except three factors as highlighted in Table 5.50). The empirical data from this case study also indicated additional findings on factors for further research (as highlighted in summary column in Table 5.50). Similar to the previous two case studies for *research issue 2*, this case study also validated and highlighted the importance of adoption lifecycle phases (as reported in Table 5.36). However, there was no new adoption lifecycle phase reported. For *research issues 3 and 4*, the differences between LGA_B and LGA_A CICTD and CSD are not marginal. However, the detailed analysis of the results of prioritisation of factors is described in Chapter 6. In concluding the empirical findings for case organisation LGA_B, this case study supported the literature findings and validated the proposed EAI adoption model in LGA_B, with revisions to the proposed EAI adoption model presented in Chapter 6.

			DIS and SAP Integration Project				
	Research Issue		Defined	Applied	Tested	Validated	Summary
Research Issue – 1: Section 3.1.3	*Factors influencing EAI adoption in LGAs.*	PC	–	–	✓	✓	*- All factors except critical mass and technological risks were validated through the case study.* *- New External Pressure Factor identified e.g. Stakeholders and industrial influence for EAI adoption.*
		CS	–	–	✓	×	
		CM	–	–	✓	×	
		MK	–	–	✓	✓	
		EF	–	–	✓	✓	
		TR	–	–	✓	×	
		ITI	–	–	✓	✓	
		PITK	–	–	✓	✓	
		ITS	–	–	✓	✓	
		DSP	–	–	✓	✓	
		TMS	–	–	✓	✓	
		ITS*	–	–	✓	✓	
		HAA	–	–	✓	✓	
		ROI	–	–	✓	✓	
		C	–	–	✓	✓	
		C*	–	–	✓	✓	
		MC	–	–	✓	✓	
		B	–	–	✓	✓	
		B*	–	–	✓	✓	
		F	–	–	✓	✓	
		S	–	–	✓	✓	
Research Issue – 2: Section 3.2	*Adoption Lifecycle Phases.*	M	–	✓	✓	✓	*- All adoption lifecycle phases were addressed while working on the DIS and SAP integration project.*
		C	–	✓	✓	✓	
		P	–	✓	✓	✓	
		AD	–	✓	✓	✓	
Research Issue – 3: Section 3.2.1	*Mapping EAI adoption factors on different Phases of the Adoption Lifecycle.*		–	✓	✓	✓	*- Results are summarised in Tables 5.38, 5.39, 5.40 and 5.41 respectively.*
Research Issue – 4: Section 3.3.1	*Prioritising the importance of EAI adoption factors on different Phases of the Adoption Lifecycle.*		–	✓	✓	✓	*- Results are summarised in Tables 5.46, 5.47, 5.48 and 5.49 respectively.*

Table 5.50: Main Findings from LGA_B Project

5.4 Case Organisation Three – LGA_C

5.4.1 Background to LGA_C

Five miles east of the city of London LGA_C (third case organisation with coded name), a London borough that has community population of approximately 254,000, originating from around the world and speaking over 100 different languages. The borough is recognised as one of the largest and most ethnically diverse local government authority in the UK, as about half the population in LGA_C belongs to ethnic minority groups. LGA_C is the local authority responsible for providing public services and political leadership within the London Borough of LGA_C. It employs more than 5000 employees and provides its services through various sectors including benefits and customer services, children and young people's services, housing and public protection, adults' services, social and environmental health services, property, education etc. These sectors receive approximately 1000-1500 citizen queries via telephone and face-to-face contacts are approximately 1000 on daily basis.

5.4.1.1 Background of LGA_C IT Infrastructure

As one of the more deprived and socially needy boroughs, yet regarded as an innovator and leader of local authorities in the UK, LGA_C was faced with considerable pressures to cope with the extensive social regeneration of the borough, while meeting statutory requirements for integrated service delivery targets, performance indicators, e-Government targets, and legislation changes. In addition, LGA_C faced funding pressures and challenges in terms of improved resource and asset management. LGA_C was also faced with strong pressures to reduce the cost of maintaining non-integrated IT infrastructure, provide better services, enhance IT infrastructure through integration, and support improved ways of working through collaboration and remote/home working capabilities. The Head of ICT (HICT), Development Service Manager (DSM) and the Principle Systems Developer (PSD) mutually agreed that:

> "... *in the late of 1990's the IT infrastructure at LGA_C was very much fragmented with different IS all over the borough and no integration, there was no communication and lack of transparency and silo mentality prevailed* ..."

Figure 5.11 illustrates the IT infrastructure in LGA_C in the late 1990's and early 2000.

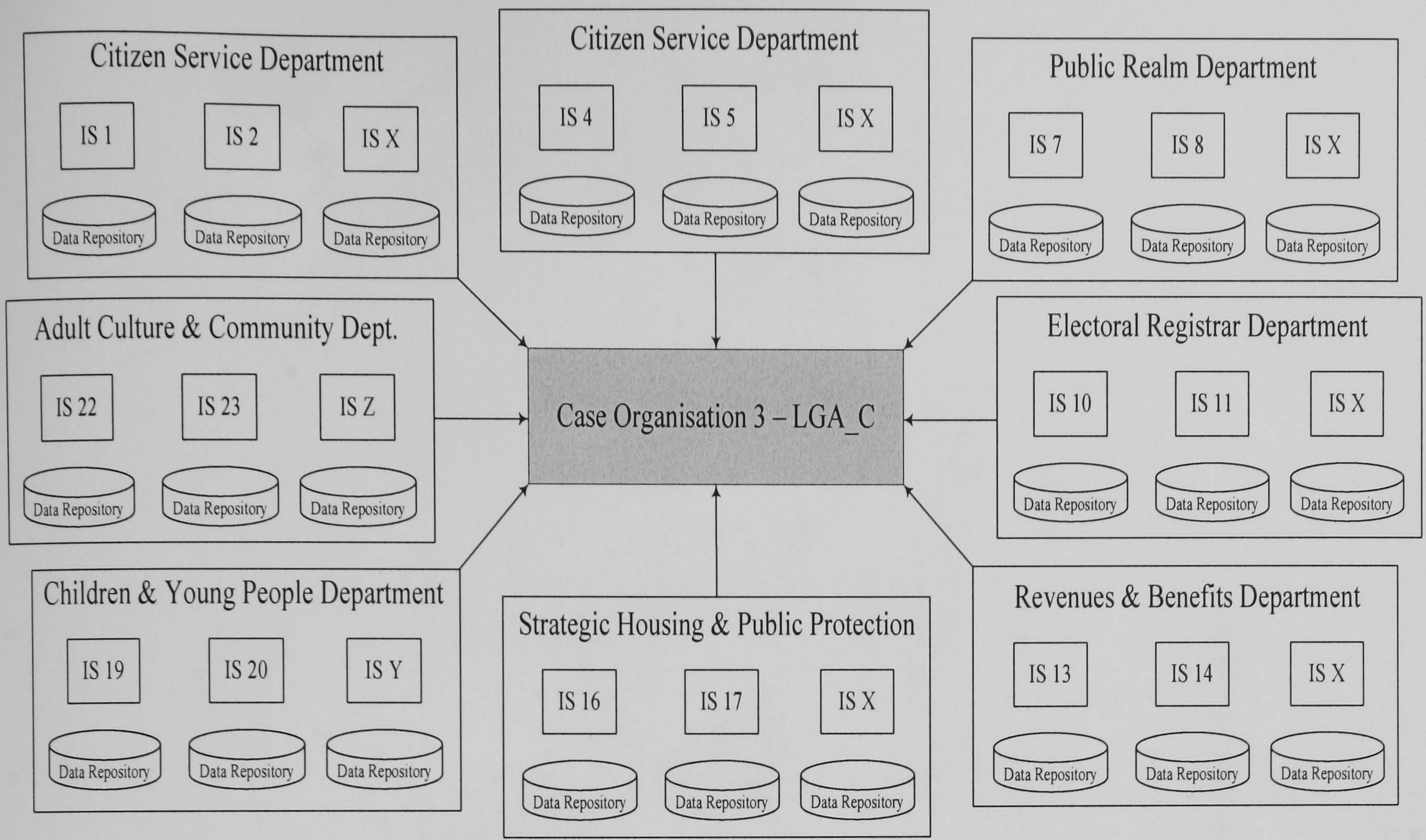

Figure 5.11: LGA_C Fragmented IT Infrastructure

The delivery of services to the community is the responsibility of LGA_C. Like other LGAs in the UK, LGA_C is working to make its services more citizen-centric and more accessible. Nevertheless, LGA_C's efforts to modernise have been hindered by an IT infrastructure that has grown in a piecemeal over the years. It used a variety of hardware of different ages, running different operating systems and software applications. Although this borough was by no means unique in having such a heterogeneous IT infrastructure, it decided that a replacement can enable it to meet its e-Government targets much more readily and contributing to improved efficiency.

LGA_C began to search for partners to help them implement integrated IT infrastructure. The scope of different projects conducted was so extensive that a high level of technological support and a willingness to transfer knowledge to them were essential requirements. Different partners supported this and a great deal more. LGA_C collaborated with several partners for the design, configuration, implementation and upgrading of a complete IT infrastructure within different departments. However, the borough faced several challenges in integrating their IT infrastructures in different departments e.g. citizen services, electoral registrar department. Figure 5.12 illustrates a recent global point-to-point IT infrastructure as provided by the service delivery manager. The principle systems developer and the development service manager also reported that there were several limitations to the point-to-

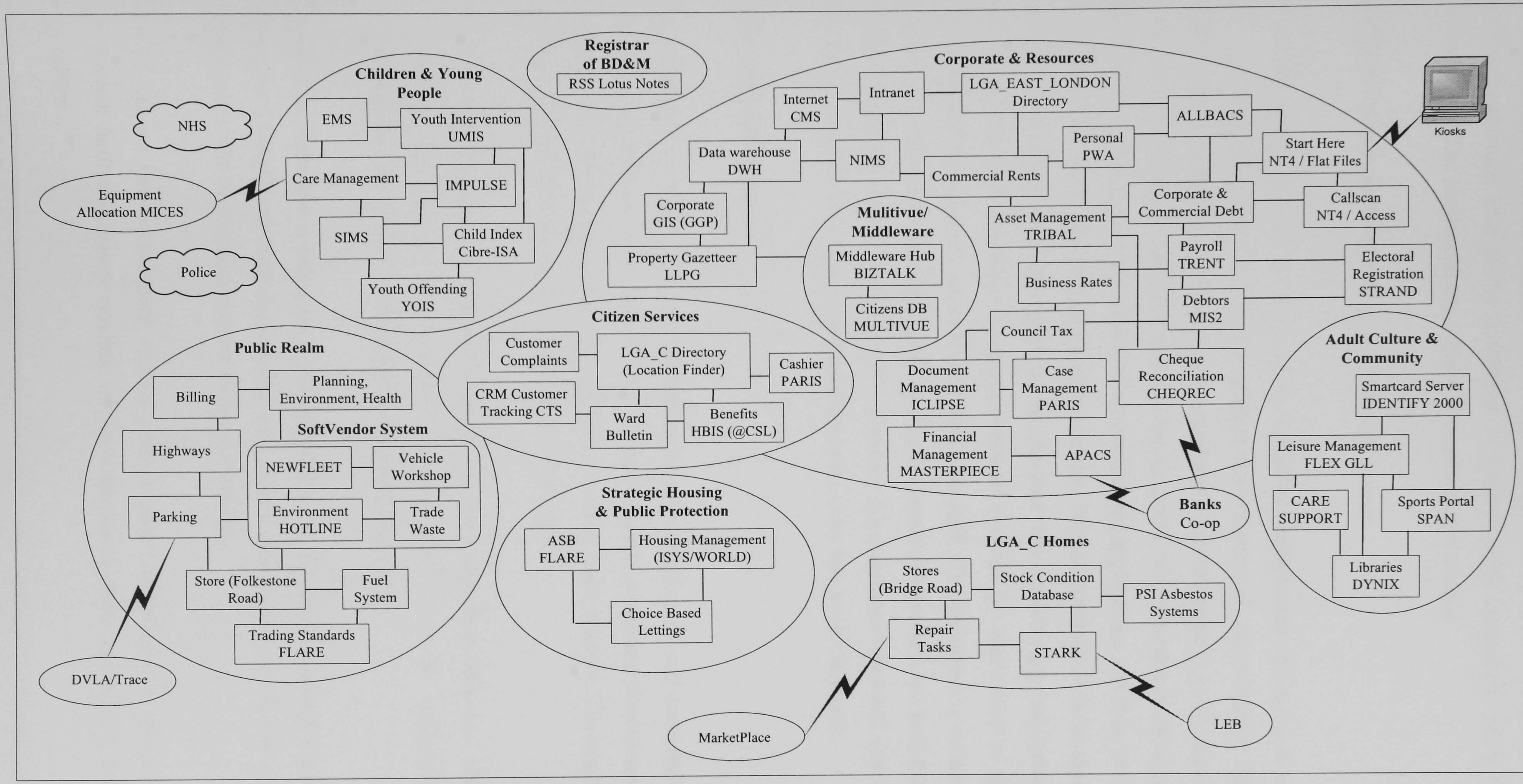

Figure 5.12: LGA_C Global Point-to-Point IT Infrastructure

point IT infrastructure. Due to the limitations in point-to-point integration, LGA_C faced several problems. The limitations are explained in subsequent section.

5.4.1.2 Limitations in Integrating IT Infrastructure

As illustrated in Figures 5.11 and 5.12, LGA_C initially implemented various IS to enhance their service delivery. These information systems did not solve all the problems. Then, the borough turned to integrated applications by developing manual point-to-point connections. However, such an approach has led to applications spaghetti, which increases the complexity of the integration solution as the number of interconnected applications rise thus, preventing in overcoming the limitations of their IT infrastructure. Several reasons for the limitations in integrating IT infrastructures were noted during the interview sessions e.g.: (a) resistance to change among the staff members, (b) compatibility of systems, (c) duplication of data, (d) meeting business requirements, (e) cost of training the staff, (f) synchronising citizen's data and (g) lack of information sharing. In the section, the researcher presents the limitations that were highlighted: (a) during the interviews, (b) from documentation provided and (c) self observations during interviews and are classified in the same way as in Chapter 2.

- **ERP Systems Failures**

  As illustrated in Figure 5.11, IT infrastructure was very diverse and consisted several incompatible systems. As a result, LGA_C faced integration problems when attempting to migrate their existing custom built applications to other ERP systems. The head of ICT and the principle systems developer mutually agreed that:

  > "*... although when we shifted to point-to-point integration with our ERP systems, we did not benefit from it because ERP is not an integration technology and it does not integrate incompatible systems ...*"

  In addition, there was a redundancy and duplication of data and functionality (which still persists at LGA_C), as many applications store similar data or run systems that overlap in functionality. The development service manager stated that:

  > "*... as we were developing manual point-to-point connections to integrate custom built and legacy systems, we were unable to share information with others ...*"

Therefore, the interviews illustrate that ERP systems did not benefit LGA_C in solving their integration problems. Thus, this validates the limitation i.e. ERP systems failures, that the move towards adopting ERP has not reduced the need for integration in LGA_C, but it even increased it.

- **Organisational Information Sharing and IS Integration**

Discussions with the interviewees demonstrate that information sharing was a problem, as the interviewees mutually agreed that:

> "... *because we did not have any IS integration in the past, we were unable to communicate and share information with other departments and even with our business partners and other councils* ..."

Thus, to address the issue of information sharing, the definition of access rights to data would appear critical to establishing what constitutes legal and legitimate access to data. While discussing on the issue of information sharing, the head of ICT reported that:

> "... *information sharing is certainly amongst the most important issues is almost all the London boroughs that indicate the inability in these boroughs to accept change and share information* ..."

On the whole, interviewees expressed the need for standardisation in data formats and the adoption of a common data model.

- **Citizen Data Security and Privacy Issues**

While discussing on data security and privacy issues with the interviewees, the reviews illustrates that it certainly is an important issue because citizen's data is very confidential and the citizens will not want the borough and its staff to misuse their important information e.g. name, age, address etc. Thus, the interviewees also mutually agreed that:

> "... *there was a need for a technological solution that assists in providing security and privacy to citizen's data* ..."

This shows that the success of any integration technology is reliant on the citizen's trust that their data is secure and confidential. Another issue with the citizen's data security and privacy relates to trust. The development service manager and principle systems developer mutually agreed that:

> "... *it is difficult to trust the staff members relating to citizen's data confidentiality* ..."

The aforesaid conceptions by the interviewees illustrate that data security and privacy is an issue and as a factor influences the decision makers to adopt a technological solution that assists in providing security and privacy to citizens data and increasing citizen's satisfaction.

- **Front-Office/Back-Office Operations and Functioning:**

While discussing on the issues of front-office/back-office operations and functioning the interviewees reported that:

> "... *IT Infrastructure was dispersed and supported by a variety of third party suppliers providing IT desktop and infrastructure services across a range of hardware, software and other devices* ..."

The front and back office operations were not integrated and this was mainly due to silo mentality that prevailed in the borough. The discussions also exemplified that the older employees did not want to change their way of working i.e. resistance to change that further deteriorated the front office and back-office operations and functioning.

- **Support Management and Decision Making Process:**

The limitations of LGA_C IT infrastructure (Figures 5.11 and 5.12) caused problems in management as well. For example, since multiple applications store data for the same entity i.e. a specific citizen, management could not retrieve the most updated data for this entity and therefore faced problems in decision-making process. The interviewees on this point mutually agreed that:

"... IT infrastructure could not efficiently support core business processes and, therefore, became an obstacle for achieving their service delivery targets ..."

Nonetheless, there was a need for better collaboration among partners by fully integrating LGA_C IT infrastructure. There was also a strong need to integrate legacy systems with existing systems to improve: (a) LGA_C IT sophistication and (b) coordination and relationships with suppliers and citizens.

Clearly, the findings on the background to LGA_C IT infrastructure indicate that there was a negative impact on the delivery of services to citizens. All the limitations are summarised in Table 5.51.

Integration Drivers	LGA_C Limitations
ERP Systems Failures:	• Data interchanging and compatibility issues. • Packaged systems incompatibility with legacy systems. • System platform incompatibility.
Organisational Information Sharing and IS Integration:	• Information sharing subject to security with departments. • Very protective about sharing data with other agencies. • No IS integration.
Citizen Data Security and Privacy Issues:	• Data Sharing. • Security of data. • Citizen's trust on the borough and its staff.
BPR in e-Government Projects:	–
Front-Office/Back-Office Operations and Functioning:	• The front and back office operations were not integrated. • Silo-mentality. • Resistance to change and lack of skilled staff.
Financial Issues in Implementing Integrated e-Government:	–
Supporting Management and Decision Making Process:	• IT infrastructure could not efficiently support management. • The inability of IT infrastructure to provide data accuracy causes problems in decision-making.

Table 5.51: LGA_C – IT Infrastructure Limitations

It appears from the interviews that the limitations of IT infrastructures presented in Section 2.2 are validated since similar views were shared by the interviewees. The results motivated the LGA_C to take the decision for EAI adoption for developing integrated IT infrastructure.

5.4.1.3 Motivations for EAI Adoption

The aforesaid IT infrastructure limitations led LGA_C to take a decision to significantly advance in service delivery by adopting EAI solution to develop an integrated IT infrastructure. The development service manager reported that:

> "... *reasons that motivated us for adopting EAI adoption were reduction in duplication of data, to some extent reduction in cost of implementing an integrated IT infrastructure, improvements in business process reengineering, savings and efficiency, streamlining processes, accuracy of data output and up-to-date information* ..."

As reported earlier that LGA_C is one of the largest boroughs in the UK with a large community size, thus, the development service manager reported that:

> "... *due to the organisational size (with our staff members as our own citizens) and community population size, along with the pressure from the higher administrative authorities, LGA_C was forced to improve the environmental health services. The reason was that community members reported several problems with the waste not collected on time... these and other issues motivated us to adopt a solution for enhancing the environmental health applications that can assist them in improving the delivery of their services* ..."

The head of ICT specifically added here that:

> "... *the bigger the organisational size and the larger the community size, the more funding we get from the central government to work on projects that are inclined towards improving the services to citizens* ... "

EAI adoption has thus played a significant part in continuing improvements within LGA_C. Due to this the borough has also been stated as an e-Government pioneer in attempting to achieve the e-Government targets. LGA_C have since completed organisational restructuring to become "one council" and embarked upon a corporate programme of business improvement that involves end-to-end process management and organisation around outcomes. LGA_C comprehensive IT infrastructure has enabled the re-launch of web presence to provide much more than a glossy front-end and enable complete engagement with the transformational government programme.

A major development in LGA_C has been the London Portal. This borough is a keen supporter of the emerging focus on the "e" representing efficient and effective Government, and integration of ICT continues to play a crucial role in the borough's corporate business efficiency/improvement programme. LGA_C believes that pervasive standards-based infrastructure is essential to support effective intra-governmental working. LGA_C's ICT service is the first public body in the world to be accredited to the BS 15000 standard based upon the IT infrastructure library. It appears that internal pressure (e.g. from top management to improve IT infrastructure) and external pressure (e.g. central government to improve service delivery) influenced EAI adoption at LGA_C. This illustrates that a factor that appears to influence EAI adoption is related to the limitations of their integration solution adopted in the past (i.e. point-to-point interconnectivity).

5.4.1.4 EAI Adoption Process

LGA_C yet still has plethora of legacy systems such as citizen's care management, housing, revenues and benefits and environmental health applications that are linked through point-to-point interconnections. These systems are efficient in supporting departmental functions, but not integrated. Thus, the borough was faced with the option of withdrawing these systems away and procuring new systems, or finding a method of migrating to a new generation of systems, which would support integrated service delivery. Due to the rich source of information available and making development more manageable, the second option was chosen to work on one integration project for the environmental health department.

In the environmental health department, the aim of the SoftVendor (their software vendor) and CRM system integration project was to provide citizens with better services and respond to their waste collection queries quickly. The head of ICT and development service manager conducted a market survey to identify and assess the available solutions in other local authorities (critical mass). Thus, based on the market survey, the project team decided to utilise an in house EAI solution i.e. XML/web services for this project. Discussing on the EAI adoption process and the reasons for selecting EAI solution; interviewees reported that:

> "*...we already had cheaper in house solution with expertise, knowledge and skills in. So basically we just did a market survey for cost evaluation, not to go and procure another solution that may have cost us lots of money. Additionally, we needed a solution that could assist us in implementing the project quickly, thus we evaluated the solution from the available options we had based how quickly we can implement this project ...*"

The discussions also revealed that the project team also have middleware solution but the main issue with that is that it is a complex setup and it is currently being upgraded and once the setup is complete for moving towards middleware, the department may start adding new services. The head of ICT and development service manager also mutually agreed that:

"*...we may at some future stage move all the point-to-point interconnections to middleware but for the moment it is disparate... despite there were some problems with point-to-point interconnections but when we integrated our systems through EAI solution, the systems physically got better and the project team along with the top management saw that the working conditions and our resources are improving i.e. performance as well as the systems improved ...*"

The head of ICT at LGA_C assigned a project champion for this project who provided a strong backing for this project. All the interviewees mutually agreed that

"*...our project champion acted a key player and among other responsibilities, the champion also assisted where and when the project needed more funding ...*"

The aforesaid views on the EAI adoption process illustrate that LGA_C faced several barriers and benefits while adopting EAI. This indicates that barriers and benefits acted as influential factors while adopting EAI solution. Thus, validating the factors (barriers, benefits, and other factors such as personnel IT knowledge, managerial capability, market knowledge, critical mass, project champion, cost, formalisation) that influenced their decision making process.

5.4.2 EAI Adoption in LGA_C – SoftVendor and CRM Integration Project

The aim of this project is to prove that EAI could be used for the development of a standardised, flexible and maintainable IT infrastructure that integrates both intra and inter-organisational business processes and applications.

- **Selection Process:** LGA_C used the latest technology to launch an appointment based, free service to collect large or bulky household waste from domestic properties. For this project, the borough collaborated with SoftVendor to introduce a waste management system that has been integrated with the in house CRM system through a centralised address database and by XML/web services. The integration of frontline system i.e. CRM with back office management tools with EAI solution (XML/web services), has increased operating efficiencies, reduced administrative task, enabled improved targeting of resources and improved citizen service. SoftVendor is a leading supplier of computer systems and integration solutions for managing local government services. SoftVendor is a large multinational organisation in the UK that develops different suites of technically advanced and web-integrated software packages.

These software packages are designed to help UK boroughs improve the management of their key public services. The software cuts paperwork, improves procedures, boost efficiency and allows councils to deliver Best Value services. As well as back office management systems for departments such as street lighting, street works, highways and waste services, SoftVendor supplies mapping software, field data capture systems and mail management systems. SoftVendor also specialises in web integration, helping other boroughs deliver e-Government by inter-linking back office systems with citizen contact centres and borough websites. Established following a management buyout in 1993, the company has become one of the leading providers of local authority service management systems in the UK. The company works in close partnership with local authority clients and contractors to implement effective IT solutions that deliver real benefits.

- **Integration Process:** The project team followed a gradual augmentation approach towards the integration of SoftVendor and CRM system. This is an incremental approach for incrementing a service at a time until all the department services are implemented.

- **The Solution:** The staff members in the corporate contact centre and local service centres record and allocate collection requests from local residents. Collection addresses are compared against the borough's LLPG in order to accurately identify the location and the request is matched to the SoftVendor system. Once a suitable appointment has been confirmed the job details are automatically recorded by SoftVendor and scheduled for completion by a collection team. Figure 5.13 illustrates the project.

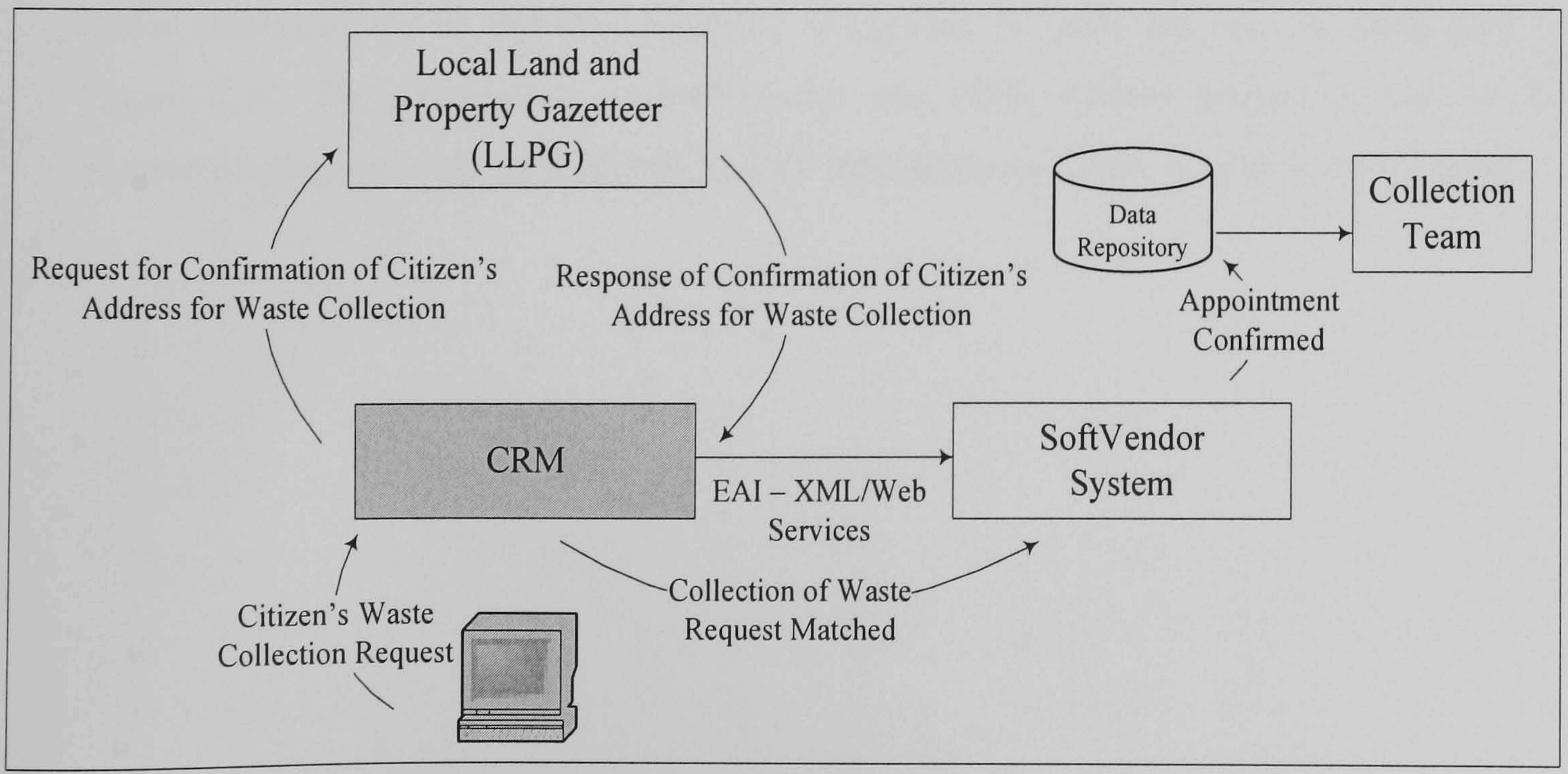

Figure 5.13: CRM Integration with SoftVendor System

The integration of CRM system with back office systems such as SoftVendor gives frontline staff confidence in dealing with requests from the public. The staff members have access to the citizen's service history, can access live service information and automatically allocate work requests. This not only improves the level of service LGA_C provides to their residents, it also reduces the administrative burden, increases operating efficiencies and enables effective targeting of sometimes limited resources.

LGA_C employs SoftVendor system to improve the recording and management of fly tipping incidents in the borough. Reports of illegally dumped waste are recorded by contact or service centre personnel, automatically located using the LLPG and logged on the SoftVendor system for removal. LGA_C, who already uses SoftVendor system to manage their weekly domestic waste and recycling collection service, also plans to roll out the solution across other property and street based services in the forthcoming months. While discussing on achieving return from this project, the head of ICT and the development service manager reported that:

> "... *in the first three months, the environmental health department has logged approximately 13,000 jobs using the integrated system. Also by comparing the pre SoftVendor business processes with the post integration processes, LGA_C estimates an improvement in business processes across all service areas over the next 12 months ...*"

For other areas in the borough, LGA_C is gradually moving towards an EAI hub and spoke methodology to develop a global integrated IT infrastructure as illustrated in Figure 5.14. The integration of SoftVendor and CRM system project is one of the completed projects within the global EAI IT infrastructure, LGA_C is moving towards.

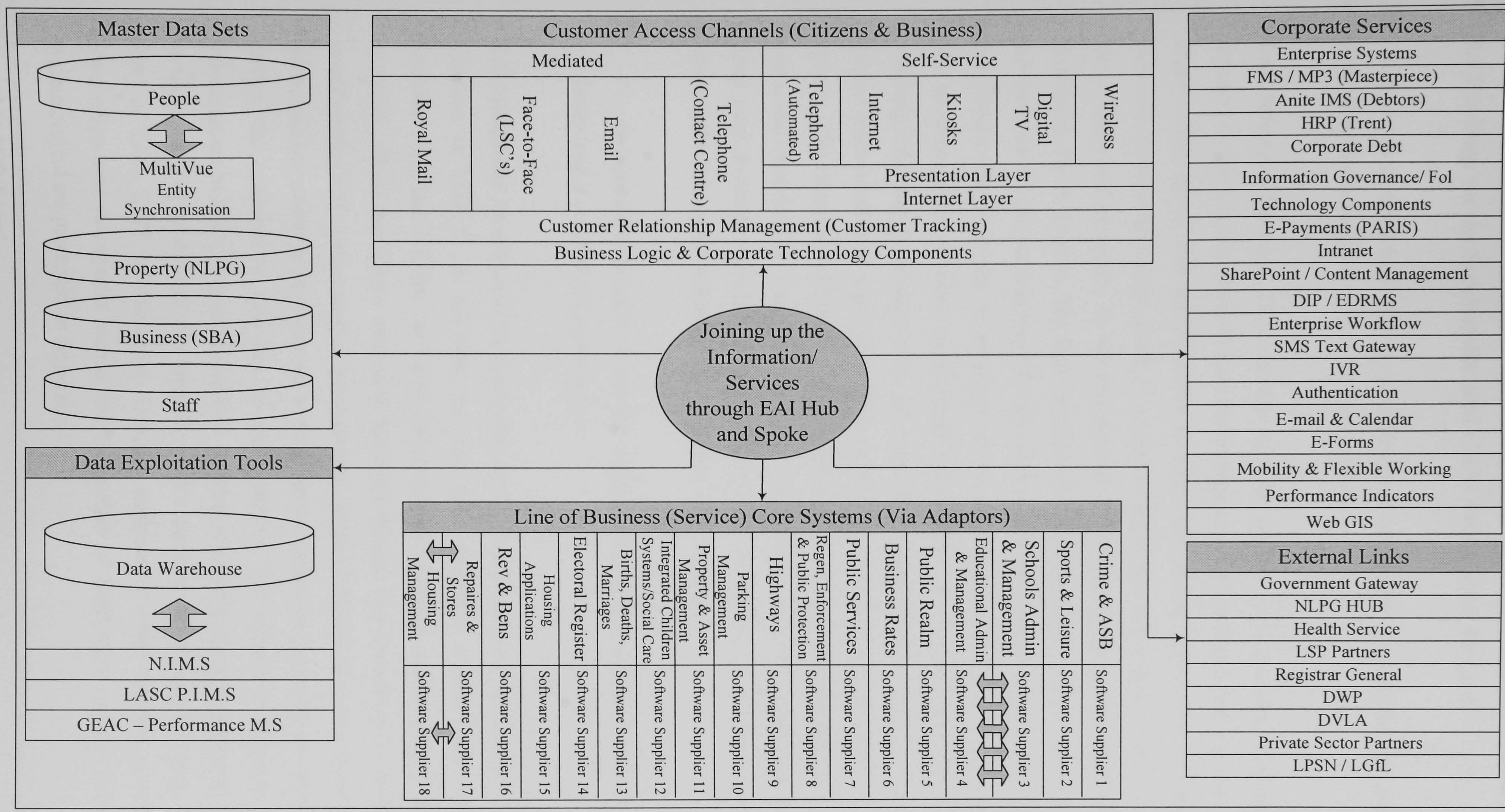

Figure 5.14: LGA_C Information Systems Architecture

5.4.2.1 Findings on the SoftVendor and CRM Integration Project

The main issues derived from this project presented earlier are summarised and described below along with the comments from the interviewees:

- **EAI Selection Process:** The selection of EAI solution is a complex and important process. As there is a marketplace confusion regarding EAI packages and solutions, many organisations spend time and resources to assess and choose appropriate EAI software. However, as reported earlier, LGA_C wanted to implement this project quickly using in-house skills and expertise. So for this purpose senior management was involved while discussing on the project. The final decision for selecting EAI solution (i.e. XML/Web services) for the project was made by the head of ICT who was also actively involved in this project. However, the development service manager reported that the project team was to some extent reluctant in selecting EAI because the team was presupposing that selecting EAI may have some risks (as reported in Appendix C). Thus, eventually the project team decided to select XML/Web services for integrating SoftVendor and CRM system. The interview discussions also illustrate that the project team did not use any consultant expertise (no expertise in terms of assistance during the integration process). They used in-house expertise of their existing staff. The development service manager reported the reasons for not selecting consultant expertise that:

  "*... we wanted to be able to use our existing staff skills, support the system better and it is better value for money ...*"

- **EAI Adoption:** As aforesaid the researcher discussed on few factors that influenced EAI adoption in LGA_C. In addition, the researcher presented several other factors in Sections 3.2.1 and 3.3 that have also influenced the decision making process for EAI adoption. All of the factors were also validated through the integration of SoftVendor system with CRM system project. For example, several EAI benefits were identified and the researcher asked the interviewees to rank them (reported in Appendix C). As reported earlier, the adoption of EAI has its own barriers. The efforts to improve the IT infrastructure at LGA_C by adopting EAI solution resulted in the facing several barriers including among others: (a) silo mentality, (b) ownership of cleaning the data, (c) low level of LGA_C IT infrastructure. Detailed analyses of other barriers extracted by observation and discussions during the integration of SoftVendor system with CRM system project are presented in Appendix C.

- **Integration Approach and Project Implementation:** The researcher suggests that the low level of IT infrastructure in LGA_C influenced the project team to adopt an integration solution that can assist the department in quickly implementing the project. The discussions with the development service manager reported that:

> "... *there was pressure from the top management to complete the project within the targeted time. For this reason (i.e. quick implementation) the project team selected an incremental approach to implement each step by step* ..."

5.4.2.2 LGA_C – Analysing the Issues under Research

To test the conceptual EAI adoption model (Figure 3.7), the researcher follows the research issues as summarised in Table 5.2 and analyses them in the following sections.

5.4.2.2.1 Testing Research Issue 1: Factors Influencing EAI Adoption in LGAs

After discussing on the IT infrastructure limitations, motivations to EAI adoption and adoption process, the interviewees were asked to comment on the importance and the involvement of EAI adoption factors in the SoftVendor and CRM systems integration project. Table 5.52 provides with the analysis of the factors based on the views from the interviewees.

	Factors Influencing EAI Adoption	HICT	DSM	PSD
PF	Project Champion	●	●	●
	Citizen's Satisfaction	⊙	⊙	●
	Critical Mass	●	⊙	⊙
	Market knowledge	⊙	●	⊙
TF	Evaluation Frameworks	⊙	⊙	●
	Technological Risks	●	●	●
	IT Infrastructure	●	●	●
	Personnel IT Knowledge	●	●	●
	IT Sophistication	⊙	⊙	●
	Data Security and Privacy	⊙	⊙	●
SF	Top Management Support	●	●	●
	IT Support	⊙	⊙	●
	Higher Administrative Authority	●	⊙	⊙
FF	ROI	●	●	●
	Cost	●	●	●
OF	Centralisation	●	⊙	⊙
	Managerial Capability	●	●	●
	Barriers	⊙	⊙	●
	Benefits	●	●	●
	Formalisation	●	⊙	⊙
	Size	●	⊙	⊙

Table 5.52: Validation of Factors Influencing EAI Adoption in LGA_C

Table 5.52 again illustrates mixed results on the importance of factors influencing EAI adoption in LGA_C. The interviewees highlighted project champion, technological risks, IT infrastructure, personnel IT knowledge, top management support, ROI, cost, managerial capability and benefits as most important factors. Other factors had mixed results. However, with the conformity of these factors with moderate and high importance, the researcher asserts that the proposed EAI adoption factors (Figure 3.2) are validated through this case study and fulfilling the *second objective* (Section 1.3) of this thesis. Results demonstrated in Tables 5.3, 5.18 and 5.35 (in the previous three case studies) and Table 5.52 in this case study; have further strengthened the researcher's justification on the importance and involvement of EAI adoption factors through LGA_C case organisation. In the subsequent sections, the researcher presents detailed analysis of the importance of EAI adoption factors.

5.4.2.2.2 Testing Research Issue 2: Adoption Lifecycle Phases

The head of ICT, development service manager and principle systems developer were asked to comment and highlight the importance of the adoption lifecycle phases (Figure 3.3) based on the SoftVendor and CRM systems integration project. The interviewees agreed that these phases are vital and they have come across these phases for this project. The head of ICT reported that:

> "*... certainly these phases are vital with a perfect breakdown and we faced these phases in this project, however, even before the motivation phase there can be another phase i.e. the driving force phase – this means that we had external pressure from the central government to improve services, so I believe the pressure represented as phase where we were motivated to find a solution ...*"

The principle systems developer reported that:

> "*... this is a fairly comprehensive adoption lifecycle and we did come across these adoption phases for our project ...*"

However, the development service manager (one of the prime members in the project) had a relatively different opinion on the adoption lifecycle phases and reported that:

> "*... the motivation and conception phases are relatively less important and not discussed about phases ... whereas, the proposal and adoption decision phases*

appear to be physical attributes of the adoption process i.e. while proposal phase ... we prepared feasibility reports to present to the chief executive and top management to discuss on the possible outcomes of for the SoftVendor and CRM systems integration project ... after several meetings the decision was taken ... that represents another phase ..."

The interviewees were also asked to illustrate the importance of the adoption lifecycle phases. The importance of each phase is presented in Table 5.53.

Adoption Lifecycle Phases	HICT	DSM	PSD
Motivation	●	⦿	●
Conception	●	⦿	●
Proposal	●	●	●
Adoption Decision	●	●	●

Table 5.53: Importance of Adoption Lifecycle Phases in LGA_C

It appears from the analysis of the project presented earlier that the adoption lifecycle phases (Figure 3.3) are validated through this and fulfilling the *third objective* (Section 1.3) of this thesis. In the next section, the researcher presents the analysis of the mapping of each factor validated through the project on the different adoption lifecycle phases.

5.4.2.2.3 Testing Research Issue 3: Mapping EAI Adoption Factors on the Adoption Lifecycle Phases

Similar to the previous case study, the researcher followed the same pattern and before commencing on the mapping of factors on the adoption lifecycle phases, the interviewees were explained on how to perform the mapping of factors. Thereafter, the interviewees were asked to map the factors (Figure 3.2) influencing EAI adoption on different phases of the adoption lifecycle (reported in Table 5.54). The interviewees mapped the factors (based on its influence) on each phase of the adoption lifecycle. The last column (results) in each phase in Table 5.54 illustrates the outcome of the mapping of factors by the interviewees for the LGA_C integration project. The results highlight varied findings from the mapping of factors on each phase. Yet again this can be attributed to the understanding and observation of each interviewee during the SoftVendor and CRM systems integration project.

		Motivation				Conception				Proposal				Adoption Decision			
	Factors	HICT	DSM	PSD	Results	HICT	DSM	PSD	Results	HICT	DSM	PSD	Results	HICT	DSM	PSD	Results
PF	Project Champion	✓	✓	✓	3/3	✓	–	–	1/3	✓	–	✓	2/3	✓	✓	✓	3/3
	Citizen's Satisfaction	–	✓	✓	2/3	–	–	–	0/3	✓	✓	✓	3/3	–	✓	✓	2/3
	Critical Mass	✓	–	–	1/3	✓	–	–	1/3	✓	✓	✓	3/3	–	✓	✓	2/3
	Market Knowledge	–	–	✓	1/3	–	✓	✓	2/3	✓	✓	–	2/3	✓	–	–	1/3
TF	Evaluation Frameworks	✓	–	✓	2/3	–	✓	✓	2/3	✓	✓	✓	3/3	✓	–	–	1/3
	Technological Risks	–	–	–	0/3	–	–	✓	1/3	✓	✓	✓	3/3	✓	✓	✓	3/3
	IT Infrastructure	✓	–	–	1/3	✓	✓	✓	3/3	✓	✓	✓	3/3	–	–	–	0/3
	Personnel IT Knowledge	✓	–	✓	2/3	✓	✓	✓	3/3	✓	✓	✓	3/3	–	–	–	0/3
	IT Sophistication	✓	–	–	1/3	✓	✓	✓	3/3	✓	✓	✓	3/3	–	–	–	0/3
	Data Security and Privacy	✓	–	–	1/3	✓	✓	✓	3/3	✓	–	–	1/3	–	✓	✓	2/3
SF	Top Management Support	✓	✓	–	2/3	–	–	–	0/3	✓	–	✓	2/3	✓	✓	✓	3/3
	IT Support	–	–	–	0/3	✓	✓	✓	3/3	✓	✓	✓	3/3	✓	–	✓	2/3
	Higher Administrative Authority	✓	✓	–	2/3	–	–	–	0/3	✓	–	–	1/3	✓	✓	✓	3/3
FF	Return on Investment	–	–	–	0/3	–	–	✓	1/3	✓	✓	✓	3/3	✓	✓	✓	3/3
	Cost	✓	–	✓	2/3	–	–	✓	1/3	✓	✓	✓	3/3	✓	✓	✓	3/3
OF	Centralisation	–	–	–	0/3	–	–	–	0/3	✓	✓	✓	3/3	✓	–	✓	2/3
	Managerial Capability	✓	–	–	1/3	–	–	✓	1/3	✓	✓	✓	3/3	✓	–	–	1/3
	Barriers	✓	–	✓	2/3	–	–	✓	1/3	✓	–	✓	2/3	✓	✓	✓	2/3
	Benefits	✓	✓	✓	3/3	✓	–	✓	2/3	✓	–	✓	2/3	✓	✓	✓	3/3
	Formalisation	–	–	–	0/3	–	✓	✓	2/3	✓	✓	✓	3/3	–	–	–	0/3
	Size	✓	✓	✓	3/3	–	–	–	0/3	–	–	✓	0/3	✓	✓	✓	3/3

Table 5.54: Mapping the Factors on the Adoption Lifecycle Phases in LGA_C

The results of the mapping of factors for each phase are summarised in Tables 5.55, 5.56, 5.57 and 5.58 respectively. The factors with less (i.e. one interviewee supporting and other two not) and no (i.e. none of the interviewees supporting) support are discarded. The reason is that these factors had less influence or did not influence on a specific phase (as reported in Table 5.54). On the other hand, factors with full (i.e. all three interviewees supporting) and moderate (i.e. two interviewees supporting and third not supporting) support (as highlighted in the last column of each phase in Table 5.54 are utilised for further empirical research.

	Motivation Phase			
	Factors	**HICT**	**DSM**	**PSD**
PF	Project Champion	✓	✓	✓
PF	Citizen's Satisfaction	–	✓	✓
TF	Evaluation Frameworks	✓	–	✓
TF	Personnel IT Knowledge	✓	–	✓
SF	Top Management Support	✓	✓	–
SF	Higher Administrative Authority	✓	✓	–
FF	Cost	✓	–	✓
OF	Barriers	✓	–	✓
OF	Benefits	✓	✓	✓
OF	Size	✓	✓	✓

Table 5.55: Summarising the Factors with Full or Moderate Support on the Motivation Phase

	Conception Phase			
	Factors	**HICT**	**DSM**	**PSD**
PF	Market Knowledge	–	✓	✓
TF	Evaluation Frameworks	–	✓	✓
TF	IT Infrastructure	✓	✓	✓
TF	Personnel IT Knowledge	✓	✓	✓
TF	IT Sophistication	✓	✓	✓
TF	Data Security and Privacy	✓	✓	✓
SF	IT Support	✓	✓	✓
OF	Benefits	✓	–	✓
OF	Formalisation	–	✓	✓

Table 5.56: Summarising the Factors with Full or Moderate Support on the Conception Phase

	Proposal Phase			
	Factors	HICT	DSM	PSD
PF	Project Champion	✓	–	✓
	Citizen's Satisfaction	✓	✓	✓
	Critical Mass	✓	✓	✓
	Market Knowledge	✓	✓	–
TF	Evaluation Frameworks	✓	✓	✓
	Technological Risks	✓	✓	✓
	IT Infrastructure	✓	✓	✓
	Personnel IT Knowledge	✓	✓	✓
	IT Sophistication	✓	✓	✓
SF	Top Management Support	✓	–	✓
	IT Support	✓	✓	✓
FF	Return on Investment	✓	✓	✓
	Cost	✓	✓	✓
OF	Centralisation	✓	✓	✓
	Managerial Capability	✓	✓	✓
	Barriers	✓	–	✓
	Benefits	✓	–	✓
	Formalisation	✓	✓	✓

Table 5.57: Summarising the Factors with Full or Moderate Support on the Proposal Phase

	Adoption Decision Phase			
	Factors	HICT	DSM	PSD
PF	Project Champion	✓	✓	✓
	Citizen's Satisfaction	–	✓	✓
	Critical Mass	–	✓	✓
TF	Technological Risks	✓	✓	✓
	Data Security and Privacy	–	✓	✓
SF	Top Management Support	✓	✓	✓
	IT Support	✓	–	✓
	Higher Administrative Authority	✓	✓	✓
FF	Return on Investment	✓	✓	✓
	Cost	✓	✓	✓
OF	Centralisation	✓	–	✓
	Barriers	✓	✓	✓
	Benefits	✓	✓	✓
	Size	✓	✓	✓

Table 5.58: Summarising the Factors with Full or Moderate Support on the Adoption Decision Phase

Factors with either full or moderate support (Tables 5.55, 5.56, 5.57 and 5.58) are utilised in the next section for prioritising their importance on each phase of the adoption lifecycle.

5.4.2.2.4 Testing Research Issue 4: Prioritising the Importance of EAI Adoption Factors on Adoption Lifecycle Phases

Tables 5.3, 5.18, 5.35 and 5.52 presented the importance of each factor, whereas Tables 5.5, 5.20, 5.37 and 5.54 illustrate the mapping of factors on different phases of the adoption lifecycle and for this case study, summarising the results in Tables 5.55, 5.56, 5.57 and 5.58. However, these tables do not illustrate the important of each factor on the adoption lifecycle phases. This section prioritises the importance of factor (with full and moderate support as reported in Tables 5.55, 5.56, 5.57 and 5.58) influencing EAI adoption. In order to prioritise the importance of factors, the following steps are followed:

- **Step 1 – Constructing the hierarchy model:** Section 4.4.2.1 explains this step in detail.

- **Step 2 – Collecting data through pairwise comparison by interviews:** Before performing the pairwise comparisons, all the interviewees were given instructions on how to conduct the comparison. The matrices corresponding to the individual pairwise ranking of the factors on each phase of the adoption lifecycle is presented in Appendix D that represent the evaluation of the factors by HICT, DSM and PSD.

- **Step 3 – Determining Normalised Priority (Local) Weights:** The normalised priority weights of all the factors (in a specific category) on different phases of the adoption lifecycle for HICT, DSM and PSD are presented in Appendix D.

- **Step 4 – Analysing and Calculating the Priority Weights:** Based on normalised priority weights from previous tables (see Appendix D for tables from previous section), the relative priority importance of EAI adoption factors in a specific category are analysed and calculated in Tables 5.59, 5.60, 5.61 and 5.62. These priority weights are obtained by using the EC software and the conclusions drawn from them are the final results of the analysis of collective judgements provided by the panel of interviewees selected for LGA_C. The results are based on the knowledge and understanding of the factors by all the interviewees in LGA_C.

	Motivation Phase			
	Factors	**HICT**	**DSM**	**PSD**
PF	Project Champion	(1) 0.0000	(1) 0.8890	(1) 0.8750
PF	Citizen's Satisfaction	(1) 0.0000	(2) 0.1111	(2) 0.1250
TF	Evaluation Frameworks	(2) 0.1428	(1) 0.0000	(2) 0.1000
TF	Personnel IT Knowledge	(1) 0.8571	(1) 0.0000	(1) 0.9000
SF	Top Management Support	(1) 0.8750	(1) 0.8750	(1) 0.0000
SF	Higher Administrative Authority	(2) 0.1250	(2) 0.1250	(1) 0.0000
FF	Cost	(1) 0.0000	(1) 0.0000	(1) 0.0000
OF	Barriers	(2) 0.2206	(3) 0.0000	(2) 0.2030
OF	Benefits	(1) 0.7116	(1) 0.8750	(1) 0.7353
OF	Size	(3) 0.0676	(2) 0.1250	(3) 0.0616

Table 5.59: Individual Priority Weights of Factors on the Motivation Phase

	Conception Phase			
	Factors	HICT	DSM	PSD
PF	Market Knowledge	(1) 0.0000	(1) 0.0000	(1) 0.0000
TF	Evaluation Frameworks	(3) 0.0000	(2) 0.0526	(3) 0.0743
	IT Infrastructure	(2) 0.0556	(2) 0.0526	(2) 0.0291
	Personnel IT Knowledge	(1) 0.4444	(1) 0.4210	(2) 0.2585
	IT Sophistication	(1) 0.4444	(1) 0.4210	(1) 0.5637
	Data Security and Privacy	(2) 0.0556	(2) 0.0526	(3) 0.0743
SF	IT Support	(1) 0.0000	(1) 0.0000	(1) 0.0000
OF	Benefits	(1) 0.0000	(1) 0.0000	(1) 0.8890
	Formalisation	(1) 0.0000	(1) 0.0000	(2) 0.1111

Table 5.60: Individual Priority Weights of Factors on the Conception Phase

	Proposal Phase			
	Factors	HICT	DSM	PSD
PF	Project Champion	(1) 0.6202	(3) 0.0000	(1) 0.7449
	Citizen's Satisfaction	(3) 0.0539	(2) 0.1000	(2) 0.2004
	Critical Mass	(3) 0.0539	(2) 0.1000	(3) 0.0546
	Market Knowledge	(2) 0.2719	(1) 0.8000	(4) 0.0000
TF	Evaluation Frameworks	(1) 0.3935	(1) 0.3935	(1) 0.5418
	Technological Risks	(1) 0.3935	(1) 0.3935	(2) 0.2389
	IT Infrastructure	(2) 0.1437	(2) 0.1437	(3) 0.1309
	Personnel IT Knowledge	(3) 0.0346	(2) 0.0346	(4) 0.0606
	IT Sophistication	(3) 0.0346	(3) 0.0346	(5) 0.0276
SF	Top Management Support	(1) 0.9000	(1) 0.0000	(1) 0.9000
	IT Support	(2) 0.1000	(1) 0.0000	(2) 0.1000
FF	Return on Investment	(1) 0.9000	(1) 0.9000	(1) 0.9000
	Cost	(2) 0.1000	(2) 0.1000	(2) 0.1000
OF	Centralisation	(4) 0.0389	(3) 0.0708	(4) 0.0307
	Managerial Capability	(1) 0.3685	(1) 0.7233	(1) 0.5385
	Barriers	(2) 0.1410	(4) 0.0000	(3) 0.0858
	Benefits	(1) 0.3685	(4) 0.0000	(3) 0.0858
	Formalisation	(3) 0.0829	(2) 0.2058	(2) 0.2594

Table 5.61: Individual Priority Weights of Factors on the Proposal Phase

	Adoption Decision Phase			
	Factors	HICT	DSM	PSD
PF	Project Champion	(1) 0.0000	(1) 0.8000	(1) 0.8000
	Citizen's Satisfaction	(1) 0.0000	(2) 0.1000	(2) 0.1000
	Critical Mass	(1) 0.0000	(2) 0.1000	(2) 0.1000
TF	Technological Risks	(1) 0.0000	(1) 0.9000	(1) 0.5000
	Data Security and Privacy	(1) 0.0000	(2) 0.1000	(1) 0.5000
SF	Top Management Support	(1) 0.7356	(1) 0.9000	(1) 0.7553
	IT Support	(2) 0.2113	(3) 0.0000	(2) 0.1881
	Higher Administrative Authority	(3) 0.0529	(2) 0.1000	(3) 0.0566
FF	Return on Investment	(1) 0.9000	(1) 0.9000	(1) 0.9000
	Cost	(2) 0.1000	(2) 0.1000	(2) 0.1000
OF	Centralisation	(2) 0.0714	(3) 0.0000	(2) 0.1134
	Barriers	(1) 0.4285	(1) 0.4615	(1) 0.4157
	Benefits	(1) 0.4285	(1) 0.4615	(1) 0.4157
	Size	(2) 0.0714	(2) 0.0769	(3) 0.0551

Table 5.62: Individual Priority Weights of Factors on the Adoption Decision Phase

Tables 5.63, 5.64, 5.65 and 5.66 illustrate the global weights-based prioritisation of factors on the adoption lifecycle phases. They have been calculated by aggregating the values of each factor and dividing the results by the number of interviewees. The results presented in these tables do not mean that any factor is insignificant. It demonstrates the interviewees' perceptions about the importance of the factors on the adoption lifecycle phases.

Prioritising the Importance of Factors on the Motivation Phase		
Factor Categories	**Factors**	**Prioritisation Result**
Organisational Factor	Benefits	(1) 0.7739
Pressure Factor	Project Champion	(2) 0.5880
Technological Factor	Personnel IT Knowledge	(3) 0.5857
Support Factor	Top Management Support	(4) 0.5833
Organisational Factor	Barriers	(5) 0.1412
Organisational Factor	Size	(6) 0.0847
Support Factor	Higher Administrative Authority	(7) 0.0833
Technological Factor	Evaluation Frameworks	(8) 0.0809
Pressure Factor	Citizen's Satisfaction	(9) 0.0787
Financial Factor	Cost	(10) 0.0000

Table 5.63: Prioritising the Importance of Factors on the Motivation Phase

Prioritising the Importance of Factors on the Conception Phase		
Factor Categories	**Factors**	**Prioritisation Result**
Technological Factor	IT Sophistication	(1) 0.4764
Technological Factor	Personnel IT Knowledge	(2) 0.3746
Organisational Factor	Benefits	(3) 0.2963
Technological Factor	Data Security and Privacy	(4) 0.0608
Technological Factor	IT Infrastructure	(5) 0.0458
Technological Factor	Evaluation Frameworks	(6) 0.0423
Organisational Factor	Formalisation	(7) 0.0370
Support Factor	IT Support	(8) 0.0000
Pressure Factor	Market Knowledge	(9) 0.0000

Table 5.64: Prioritising the Importance of Factors on the Motivation Phase

Prioritising the Importance of Factors on the Proposal Phase		
Factor Categories	**Factors**	**Prioritisation Result**
Financial Factor	Return on Investment	(1) 0.9000
Support Factor	Top Management Support	(2) 0.6000
Organisational Factor	Managerial Capability	(3) 0.5434
Pressure Factor	Project Champion	(4) 0.4550
Technological Factor	Evaluation Frameworks	(5) 0.4429
Pressure Factor	Market Knowledge	(6) 0.3573
Technological Factor	Technological Risks	(7) 0.3419
Organisational Factor	Formalisation	(8) 0.1827
Organisational Factor	Benefits	(9) 0.1514
Technological Factor	IT Infrastructure	(10) 0.1394
Pressure Factor	Citizen's Satisfaction	(11) 0.1181
Financial Factor	Cost	(12) 0.1000
Organisational Factor	Barriers	(13) 0.0756
Pressure Factor	Critical Mass	(14) 0.0695
Support Factor	IT Support	(15) 0.0667
Organisational Factor	Centralisation	(16) 0.0468
Technological Factor	Personnel IT Knowledge	(17) 0.0433
Technological Factor	IT Sophistication	(18) 0.0323

Table 5.65: Prioritising the Importance of Factors on the Proposal Phase

Prioritising the Importance of Factors on the Adoption Decision Phase		
Factor Categories	**Factors**	**Prioritisation Result**
Financial Factor	Return on Investment	(1) 0.9000
Support Factor	Top Management Support	(2) 0.7969
Pressure Factor	Project Champion	(3) 0.5333
Technological Factor	Technological Risks	(4) 0.4667
Organisational Factor	Benefits	(5) 0.4352
Organisational Factor	Barriers	(5) 0.4352
Technological Factor	Data Security and Privacy	(6) 0.2000
Support Factor	IT Support	(7) 0.1331
Financial Factor	Cost	(8) 0.1000
Support Factor	Higher Administrative Authority	(9) 0.0698
Organisational Factor	Size	(10) 0.0678
Pressure Factor	Critical Mass	(11) 0.0667
Pressure Factor	Citizen's Satisfaction	(11) 0.0667
Organisational Factor	Centralisation	(12) 0.0616

Table 5.66: Prioritising the Importance of Factors on the Adoption Decision Phase

According to the empirical findings in this case study, all the factors were validated through this case study for the reason as reported earlier in Section 5.4.2 by the interviewees. Factors have either directly or indirectly influenced the decision making process for EAI technological solution adoption. The mapping of factors reported in Tables 5.55, 5.56, 5.57 and 5.58 are associated with the prioritisation results reported in Tables 5.63, 5.64, 5.65 and 5.66. Each factor mapped on each phase in Step 3, was prioritised based on its importance in that phase in Step 4. Detailed analysis of the prioritisation results is reported in Chapter 6, while revising the factors influencing EAI adoption in LGA_C.

5.4.3 Summarising the Findings Obtained from LGA_C Project

The empirical findings illustrated in Section 5.4.2 indicate that the proposed conceptual model (Figure 3.7) can be used for EAI adoption in LGAs. The reason is that the case study presented for LGA_C has validated the research issues reported in Table 5.2 with marginal differences from LGA_A CICTD, CSD and LGA_B. Similar to the previous three case studies for *research issue 1*, this case study further strengthens the researchers' literature findings (factors proposed in Figure 3.2) by validating the factors influencing EAI adoption through empirical research (however, this case study validates all the factors either as full or moderate important factor). The empirical data from this case study also indicated additional findings on factors for further research (as highlighted in summary column in Table 5.67).

Similar to the previous three case studies for *research issue 2*, this case study also validated and highlighted the importance of adoption lifecycle phases (as reported in Table 5.59). The interviewees reported a new adoption lifecycle phase i.e. driving force phase that is prior to motivation phase. For *research issues 3 and 4*, the differences between LGA_A CICTD, CSD, LGA_B and LGA_C are again relatively marginal. However, the detailed analysis of the results of prioritisation of factors is described in Chapter 6. In concluding the empirical findings for case organisation LGA_C, this case study supports the literature findings and validates the proposed EAI adoption model in LGA_C, with revisions to the proposed EAI adoption model presented in Chapter 6.

			SoftVendor and CRM Systems Integration Project				
Research Issue			**Defined**	**Applied**	**Tested**	**Validated**	**Summary**
Research Issue – 1: Section 3.1.3	*Factors influencing EAI adoption in LGAs.*	PC	–	–	✓	✓	*- All factors were validated through the case study.* *- New External Pressure Factor identified e.g. Stakeholders pressure for information sharing.* *- New Internal Pressure Factor identified e.g. Pressure from Top Management for working towards making data consistent.* *- New Support Factors e.g. support from other LGAs for consultation of issues.*
		CS	–	–	✓	✓	
		CM	–	–	✓	✓	
		MK	–	–	✓	✓	
		EF	–	–	✓	✓	
		TR	–	–	✓	✓	
		ITI	–	–	✓	✓	
		PITK	–	–	✓	✓	
		ITS	–	–	✓	✓	
		DSP	–	–	✓	✓	
		TMS	–	–	✓	✓	
		ITS*	–	–	✓	✓	
		HAA	–	–	✓	✓	
		ROI	–	–	✓	✓	
		C	–	–	✓	✓	
		C*	–	–	✓	✓	
		MC	–	–	✓	✓	
		B	–	–	✓	✓	
		B*	–	–	✓	✓	
		F	–	–	✓	✓	
		S	–	–	✓	✓	
Research Issue – 2: Section 3.2	*Adoption Lifecycle Phases.*	M	–	✓	✓	✓	*- All adoption lifecycle phases were addressed while working on the project with identification of new phase i.e. driving force phase.*
		C	–	✓	✓	✓	
		P	–	✓	✓	✓	
		AD	–	✓	✓	✓	
Research Issue – 3: Section 3.2.1	*Mapping EAI adoption factors on different Phases of the Adoption Lifecycle.*		–	✓	✓	✓	*- Results are summarised in Tables 5.55, 5.56, 5.57 and 5.58 respectively.*
Research Issue – 4: Section 3.3.1	*Prioritising the importance of EAI adoption factors on different Phases of the Adoption Lifecycle.*		–	✓	✓	✓	*- Results are summarised in Tables 5.63, 5.64, 5.65 and 5.66 respectively.*

Table 5.67: Main Findings from LGA_C Project

5.5 Conclusion

Chapter 5 analysed and presented the EAI adoption practices by three local government authorities, namely LGA_A, LGA_B and LGA_C. Empirical data for the present study were extrapolated through various sources of data like interviews, documentation and observation from these case organisations. The purpose of this data collection was to test the conception EAI adoption model proposed in Chapter 3 including the: (a) factors influencing EAI adoption in LGAs, (b) adoption lifecycle phases, (c) mapping of factors adoption lifecycle phases and (d) prioritising the importance of factor on adoption lifecycle phases using the AHP technique. Data was collected until there was enough data to test the proposed EAI adoption model. As highlighted in Tables 5.33, 5.50 and 5.67, most of the factors and all the adoption lifecycle phases were validated through the case studies, thus, supporting the researchers' literature findings on the proposed EAI adoption factors and adoption lifecycle phases in Chapter 3. The data collected from the three case organisations was confirmed to be of relatively similar significance, therefore, it can be said that selecting another case study would have provided comparatively similar results.

According to the empirical data from the three case organisations, the proposed conceptual model is appropriate for studying the research context. The analysis and study of the model was made carefully and specifically to fit and be compatible within the context local government authorities. As a result, it was apparent from the empirical data that factors proposed in the conceptual model have influenced the decision making process for EAI adoption in the three case organisations. AHP technique is designed to facilitate sound decision making by using both empirical data as well as subjective judgments of the decision-maker. AHP assists with the decision making process by providing decision-makers with a structure to organize and prioritise the importance of various factors. However, the full assessment and the modification of the proposed model and the associated factors is elaborated in Chapter 6. The main conclusions drawn from investigating EAI adoption in three UK local government authorities are summarised below:

- ***Finding 1:*** Empirical evidence extracted from the case organisations suggest that IT adoption in the UK local government domain has been through a considerable continuous process. Most successful developments of IT in LGAs in the past have been centred on supporting and improving infrastructure and internal processes. However, in the 1990's the focus of IT shifted in improving LGA business processes and service delivery. Furthermore in 2000 and onwards, the focus of IT usage resulted in LGAs adopting several IT applications e.g. CRM and GIS etc, to improve legacy business processes, service delivery to citizens with-to-date information and improving IT infrastructure. The evident support from the case organisations and the documents provided for the essential focus was to see the computer not just as a tool to provide information, but rather as a communication and integration tool.

- ***Finding 2:*** The empirical findings suggest that the IT implementation decisions in the UK local government domain have gone through several phases. As a result, the IT infrastructure of all three case organisations resulted as non-integrated. Consequently, the case organisations faced integration problems while working with other LGAs, partners and other government bodies. Thus, it was difficult for all the case organisations to reconfigure and integrate all the applications that run on the mainframe and non-mainframe platforms. In addition, there was a redundancy of data and functionality as many applications stored similar data or run systems overlapping in functionality. Additionally, the non-integrated infrastructure caused many problems, since it could not achieve integration. As a result, the case organisations could not take advantage of IT and support closer collaboration with their various stakeholders. Thus, the IT infrastructure limitations motivated the case organisations for integration.

- ***Finding 3:*** The findings from the case organisations confirm that external pressures from stakeholders for the provision of integrated service delivery to the citizens, information sharing and shared services with other LGAs represented a highly influencing factor that resulted EAI adoption in the case organisations. The stakeholder pressure is from peers, residential, ICT suppliers, private sector, and competition also represent external pressures. In addition, top management pressure for project delivery on time and pressure from the head of department to have standardisation of work processes and work without conflict in the organisation represented internal pressures. All these external and internal pressures influencing EAI adoption represented decisive factors.

- ***Finding 4:*** Empirical evidence from the case organisations indicates that the evaluation frameworks for the assessment and selection of integration technologies and packages represented a relatively less influencing factor for EAI adoption. Case data indicates that the case organisations went through their own several criteria for assessing EAI solutions. It appears that frameworks proposed by Themistocleous (2002) for the evaluation of EAI technologies and packages had an indirect impact in selecting EAI solutions. Thus, it can be said that evaluation framework represented as a factor that indirectly influenced EAI adoption in the case organisations.

- ***Finding 5:*** Several EAI risks were reported from the case organisation findings e.g. selection of EAI product supplier, identifying EAI business needs, EAI adoption after implementation, escalation of cost during EAI implementation, EAI a new technology so not yet stable for the LGAs, EAI may not be able to deliver the benefits, lack of commitment to EAI projects, delivery time scale, resistance to change i.e. while adopting EAI. All the risks identified illustrate that EAI technological risk represents a factor that influenced the adoption of EAI in these case organisations.

- ***Finding 6:*** The findings from the case organisations illustrate that benefits represent an important factor during the evaluation of EAI. Thus, all the case organisations have achieved several benefits with the availability of right information at the right time and right place. For example, benefits include rationalising technical skills requirements, reduced data errors, citizen satisfaction, integration of business processes, support in the provision of better service delivery, improving data quality, flexibility of work place, allows organisations to do business more effectively.

- ***Finding 7:*** The findings from the case organisations also indicate that these LGAs have experienced several barriers during the adoption EAI process. These included funding from central government to work on different EAI projects, lack of employees on EAI skills, weak vendor support for EAI, resistance to change, high cost required for EAI implementation, security and confidentiality concerns about citizen data, reluctant to share data etc. Thus, barriers represent a factor that influenced the adoption of EAI in these case organisations.

- ***Finding 8:*** AHP technique allows individuals to express their preferences that further assists in making flexible decision making to set priorities among different factors. The application of AHP technique demonstrates the prioritisation of the influencing factors for the adoption of EAI in the case organisations. This revealed how the numeric values are assigned to represent the importance of each factor over other factors in a given factor category. This enhances the quality of the evaluation process. Moreover, this provides insights into the direction of better understanding of interdependencies of the factors that influence EAI adoption. This approach may support the quality of decision-making in local government authorities when considering the adoption of EAI.

Modifications to the EAI adoption model based on the empirical findings presented in this chapter are carried out in Chapter 6.

6

Chapter 6: Revised EAI Adoption Model in LGAs

Summary

The preceding chapter examined the research issues identified in Chapter 3, which dealt with: (a) the factors that influence the decision making process for EAI adoption in the case organisations, (b) adoption lifecycle phases and (c) mapping and prioritising the importance of EAI adoption factors on different phases of the adoption lifecycle. In doing so, Chapter 5 analysed and presented case studies that were conducted in three London boroughs. The issues in practice and the empirical evidence that resulted from the analysis in the Chapter 5 indicate the need for modifications to the conceptual model as proposed in Figure 3.7. This chapter takes into consideration the empirical data to revise the conceptual EAI adoption model. In doing so, satisfying the aim and objectives of this thesis by offering the decision-makers and researchers a model for enterprise application integration adoption in the local government authorities.

6.1 Delineating the Current Research

Chapter 1 highlighted the need and importance of investigating EAI adoption in the local government authorities. Chapter 2 contributes towards developing a better understanding on EAI in LGAs based on the review of the literature on EAI adoption in private and healthcare sector. Hence, the main research issues derived from Chapter 2 are: (a) the theoretical models that describe EAI adoption in LGAs are limited thus, a relative void exists for investigating EAI adoption in LGAs, (b) the private and public sectors have different organisational structure, culture and decision making process compared to LGAs thus, it may be possible that LGAs focus on different factors when taking decisions for the adoption of EAI, (c) existing EAI models do not map the influential factors (Table 2.2) on different phases of the adoption lifecycle and (d) existing EAI models do not prioritise the factors based on their importance on different phases of the adoption lifecycle.

To address these research issues, Chapter 3 proposed a conceptual model that can be used to explain EAI adoption in LGAs (Figure 3.7). The main research issues proposed in Chapter 3 for empirical investigation are: (a) the proposed factors (Figure 3.2) can influence the decision making process for EAI adoption in LGAs, (b) LGAs can pass through several adoption lifecycle phases (Figure 3.3) while adopting EAI, (c) the influential factors for EAI adoption can be mapped on different adoption lifecycle phases to support the decision makers while adopting EAI and (d) prioritising the factors based on their importance on adoption lifecycle phases can influence EAI adoption in LGAs (Table 3.3). Chapter 4 justified the selection of a research methodology that was used to test the proposed conceptual model. In doing so, interpretivism, qualitative multiple case study approach was selected for this thesis with the empirical research methodology graphically represented in Figure 4.1. The research methodology was used in Chapter 5 to test the proposed conceptual model.

Chapter 5 offered much empirical data that was derived from three case organisations (in Sections 5.2, 5.3 and 5.4). The empirical data can be used as an evidence to revise the proposed conceptual model (Figure 3.7) for EAI adoption in LGAs. Chapter 6 takes into consideration the empirical findings derived from Chapter 5 and offer revisions to the conceptual model for EAI adoption in LGAs. Section 6.2, illustrates the lessons learned from the empirical research conducted in the case organisations. Thereafter, Section 6.3.1 revises the EAI adoption factors. Modifications are made to the EAI adoption factors by adding six new factors that are derived from the empirical research. These factors are related to: (a) pressure factor category, (b) support factor category and (c) financial factor category. In Section 6.3.2, modifications are made to the adoption lifecycle phases that are derived from the empirical research i.e. four new adoption phases namely: (a) external driver phase, (b) driving force phase, (c) research phase and (d) discussion phase and designating adoption decision phase as investment phase. Chapter 6 concludes with the development of a novel model for EAI adoption that can be used as a decision-making tool by the local government authorities during the EAI evaluation process. It is not claimed that the proposed model (Section 6.3.3) is appropriate for all decision-making situations; however, it can establish itself as being beneficial to LGAs while adopting EAI.

6.2 Lessons Learned from the Case Organisations

Through the empirical findings presented in Chapter 5, the researcher studied the area of EAI adoption in the case organisations by: (a) testing and validating the factors influencing EAI adoption, (b) testing and validating adoption lifecycle phases, (c) applying the adoption lifecycle phases for mapping the factors and (d) prioritising the importance EAI adoption factor (in their specific factor categories) on different phases of the adoption lifecycle. No claim(s) for generalisation is made for interpretive research of this type. It is not the intention of this thesis to offer prescriptive guidelines for EAI adoption in LGAs, but rather to describe case organisation perspectives that allow others to relate their experiences to those reported. Hence, this thesis offers a broader understanding of the phenomenon of EAI adoption in LGAs. Therefore, the lessons learnt are a result of the description provided and do not seek to be prescriptive. These lessons might be helpful to LGAs as well as to researchers, integrators and IT practitioners and are summarised below:

- ***Lesson 1:*** Low level of IT sophistication leads organisations to seek support from external entities (e.g. consultants). Case organisations have relied on the consultants and vendors support. This indicates that the level of IT sophistication in the case organisations was low. This is a high risk strategy and may also cost the organisations high investments for extra support. To address these issues the organisations need to employ practitioners with EAI skills or at least train their existing IT staff before they start the project.

- ***Lesson 2:*** The mapping of factors on adoption lifecycle phases can support in better understanding the factor(s) influencing EAI adoption in the local government authorities (as highlighted in Tables 5.5, 5.20, 5.37 and 5.54 and results summarised in Tables [5.6, 5.7, 5.8 and 5.9]; [5.21, 5.22, 5.23 and 5.24]; [5.38, 5.39, 5.40 and 5.41] and [5.55, 5.56, 5.57 and 5.58] respectively). This is important as it can support the managements' decision-making process during the introduction of EAI solutions in LGAs.

- ***Lesson 3:*** Prioritising the importance of EAI adoption factors on adoption lifecycle phases can further enhance the decision making process in LGAs. During the mapping of factors, the importance of factors was not recognised. Prioritising the importance of EAI adoption factors on adoption lifecycle phases, can assist LGA officials in realising and understanding the factor(s) influencing EAI adoption in LGAs. For the proposed AHP technique (although the researcher does not claim that AHP is the best technique), literature indicates that AHP can support the decision-makers to realising the importance of factors (prioritisation results as highlighted in Tables [5.14, 5.15, 5.16 and 5.17]; [5.29, 5.30, 5.31 and 5.32]; [5.46, 5.47, 5.48 and 5.49] and [5.63, 5.64, 5.65 and 5.66].

- ***Lesson 4:*** Empirical findings on the mapping of factors and prioritising the importance of EAI adoption factors on adoption lifecycle phases reflect that each interviewee from each case organisation has relatively different conception while mapping the factors and prioritising the importance of factors on adoption lifecycle phases (despite working on the same project in their respective case organisation). This illustrates that the interviewees' understanding, knowledge and ability to comprehend the importance of factors within each case organisation is different.

- ***Lesson 5:*** Empirical findings from the case organisations related to the mapping of factors on the adoption lifecycle phases and prioritising the importance of factors on the adoption lifecycle phases cannot be generalised as they differ from one case organisation to the other.

- ***Lesson 6:*** Interview discussions emphasize that central government funding for LGAs are directly related to the number of citizens (i.e. community size). So the bigger the community size, more funding is available from the central government. However, funding for LGAs that are bigger in size may vary depending on the resources retained. The demographics also influence to get more funding from the central government.

- ***Lesson 7:*** The empirical findings confirmed that, just like any other sector, top management in the local government authorities maintain a steady pressure for projects to be delivered on time. There is also the pressure to work to standards and maintain progress with out conflict from the head of the IT departments. These conventional pressures are one of the significant drives towards EAI adoption in the local authorities.

- ***Lesson 8:*** Another important lesson learned during from the case organisations is that the security and privacy of the citizens' data is a critical issue. The community view of the information requires protection of citizens' information at different levels. For example, there may be instances where core information, such as a citizen address, date of birth etc, needs to be protected. In other instances, the entire citizen record may require the application of an additional level of security. The security policy still needs guidance from a national perspective. This means that further work should be done on this area, as these issues are critical for the success of the integrated systems.

6.3 The Revised Model for EAI Adoption in LGAs

Having completed the empirical findings, as described in Chapter 5, it is appropriate to review and amend the proposed conceptual model (Figure 3.7) in the light of those findings. In the following sections, this chapter first reviews the selection of factors influencing EAI adoption, then the suggested adoption lifecycle phases, and finally, the review takes an overview of the three case organisations and the application of the EAI model in LGAs.

6.3.1 Findings and Revised EAI Adoption Factors

In this section, the researcher presents the findings regarding EAI adoption factors derived from the case studies conducted in three organisations. In doing so, the researcher develops an evaluation matrix that depicts the similarities and differences of the proposed EAI adoption factors across the four case studies in three case organisations. Tables 6.1, 6.2, 6.3, 6.4 and 6.5 illustrate the synthesis of the revised EAI adoption factors using the findings derived from the case organisations during the interview discussions. These tables confirm the validation of the EAI adoption factors with new factors that are derived from the empirical data. As reported in Chapter 5, analysis of the empirical data illustrate that most of the factors proposed for EAI adoption (Figure 3.2) have been supported by the fieldwork (validated and summarised in Tables 5.3, 5.18, 5.35 and 5.52). The researcher also derived new influential factors from the empirical research. These new factors played an important role in the EAI adoption process in the case organisations. The revised factors can also allow others to relate their experience of the case enquires reported in Chapter 5.

	Factors	EAI Demonstration Pilot Project	e-Forms & CRM Integration Project	DIS and SAP Integration Project	SoftVendor and CRM System
Pressure Factors	Project Champion	An important member of the organisation that has taken a senior lead and responsibility in different integration projects.	An important player that leads both technological and business projects.	A crucial player at the management level as EAI was to be adopted across the business enterprise and without his support it would not be possible.	Project champion has been an important and key player in leading this integration project.
	Project Delivery Time	Pressure from top management to complete projects on time and deliver on set target dates.	There has been pressure from management to deliver the project on time.	The top management pressurised the project team to deliver the project on time.	An important factor as there was pressure from the top management to deliver the project on time.
	Data Consistency	Data consistency i.e. data in a compatible format has been a critical internal pressure.	Data duplication and inconsistencies has been an important internal pressure.	Unreliable data with inconsistencies has been an important internal pressure.	Data duplication and inconsistencies in matching data with other systems has been a pressure.
	Citizen Satisfaction	Critical at all times and sometimes surveys conducted to enquire about service provision to citizens.	Has been a prime factor and influenced the CSD project team for EAI adoption.	Although reported as an important factor but *NOT VALIDATED* (see Table 5.50) in the case study conducted at LGA_B.	A prime factor and influenced the LGA_C project team for EAI adoption.
	Critical Mass	Taking reactive approach rather than proactive as and when needed.	CSD project team investigated and analysed the solutions of other boroughs and how it benefited them	*NOT VALIDATED* (see Table 5.50) because LGA_B do not look at other boroughs as they are the front-runners in areas of expertise on EAI.	LGA_C project team initially investigated and analysed the solutions of other boroughs and how it benefited them
	Market Knowledge	Conduct market research to acquire knowledge on technologies and what other boroughs do in terms of technological developments.	One of the prime important factors that influenced EAI adoption in CSD.	It has been an important factor the reason being that you need to be aware of what is available in the market about a particular technology i.e. EAI.	One of the important factors that influenced EAI adoption because without knowledge on different integration technologies it is not possible to proceed.
	Stakeholders Pressure	Pressure from different stakeholders e.g. peers and community etc for information sharing, shared services and improving service provision.	Pressure from different stakeholder e.g. peers from other departments and citizens for information sharing and improving service provision.	Pressure from different stakeholders e.g. industry / commercial practices for adopting EAI and for information sharing and shared services.	Pressure from different stakeholders e.g. suppliers, partners, community, etc for information sharing, shared services and improving service provision.
	Competition	Competition between neighboring boroughs to be more productive in service delivery to citizens.	Competition between neighboring boroughs to be more productive in service delivery and responsive to citizen queries.	–	Pressure from central government to achieve the e-Government targets developed a competitive environment for improving services.

Table 6.1: Analysis of the Revised Pressure Factors across the Case Organisations

	Factors	EAI Demonstration Pilot Project	e-Forms & CRM Integration Project	DIS and SAP Integration Project	SoftVendor and CRM System
Technological Factors	Evaluation Framework	Important but did not use any evaluation framework in stead relied on Softcom, thus *NOT VALIDATED* (see Table 5.33).	The evaluation method used by CSD was Best Value to asses EAI. In addition, the project team followed a pilot evaluation method to test the information flow between CRM system and the e-Forms.	Evaluating EAI tools has been important at LGA_B and for this project; the project team did benchmarking with EAI tools provided by different suppliers.	Evaluating EAI tools has been important at LGA_C; however, and for this project they followed the suggestions of their SoftVendor.
	Technology Risks	Escalation of cost, chosen EAI product may not solve the problem and adoption after implementation, are EAI risks.	CSD faced EAI risks while implementing the CRM system and e-Forms integration project i.e. selection of supplier etc and identifying the business needs.	This factor was *NOT VALIDATED* (see Table 5.50) because LGA_B project team did not face any risks as reported by the interviewees.	Crucial factor and faced several risks e.g. EAI may not deliver the benefits, EAI may not work, lack of EAI skills, lack of commitment to EAI projects etc.
	IT Infrastructure	IT infrastructure was non-integrated with little link between IS.	IT infrastructure was constructed based on silo mentality i.e. applications were developed with different operating systems and platforms.	A critical factor because if the department does not have sufficient IT infrastructure then there is no need for EAI adoption.	IT infrastructure was constructed based on silo mentality i.e. applications were developed with different operating systems and platforms.
	Personnel IT Knowledge	A mandatory requirement and important to be able to work on an IT project.	An important requirement to be able to work on integration projects.	An important requirement to be able to work on integration projects.	As reported a vital factor but IT knowledge among the staff members was extremely limited.
	IT Sophistication	CICTD facing IT sophistication problems with lack of skilled EAI staff.	CSD facing IT sophistication problems with lack of skilled EAI staff and lack of resources.	IT sophistication has influenced LGA_B because it has assisted in secure staff information.	IT sophistication has influenced LGA_C because it has assisted in securing data through latest technologies.
	Data Security & Privacy	To integrate systems, there is a need to share data, which is an issue. After data sharing, is data privacy secured? Thus, it is still a serious issue.	Has been one of the most important problems to meet because citizens' data may contain important information.	Concerns over citizen data security and privacy have certainly been a continued problem and has been a barrier in integration.	An important issue as citizens' data may contain vital information and to use citizen data for sharing with other departments their consent is required.

Table 6.2: Analysis of the Revised Technological Factors across the Case Organisations

	Factors	EAI Demonstration Pilot Project	e-Forms & CRM Integration Project	DIS and SAP Integration Project	SoftVendor and CRM System
Support Factors	Top Management Support	Has always been very significant in supporting for integration projects.	In CSD top management support has been very important in supporting for integration projects.	Has always been very significant in supporting for integration projects.	Has always provided support moreover, there was also pressure from the top management to deliver the project on time.
	IT Support	Had significant support from Softcom for their EAI-DPP project but seems to be a relatively less important factor.	Their software vendor provided the necessary IT support along with the market survey to improve their IT capabilities.	The project team had relevant IT support from their software vendor.	An important factor and had significant IT support from SoftVendor for their project.
	Higher Administrative Authority	Has been substantially important in providing support for sharing of data and in improving services.	Has been very important in providing support for sharing of data with other departments and in improving services to citizens.	Has been very important in providing support for sharing of data with other departments and in improving services to citizens.	Has been substantially important in providing support for data sharing and improving services.
	Stakeholders Support	General administrative and availability of skilled staff may be good support factors for our integration projects.	–	LGA_B had support from other neighbouring boroughs on service delivery and shared services.	General support from other neighbouring boroughs to consult service delivery issues and information sharing.

Table 6.3: Analysis of the Revised Support Factors across the Case Organisations

	Factors	EAI Demonstration Pilot Project	e-Forms & CRM Integration Project	DIS and SAP Integration Project	SoftVendor and CRM System
Financial Factors	Return on Investment	Has been very important, as the experiences of the EAI_DPP would assist them in realising significant ROI while implementing a major EAI project.	Sometimes it is difficult to prove because of the silo mentality that still prevails in the CSD department. Thus, this factor was *NOT VALIDATED* (see Table 5.33) through this case study.	Expecting to achieve a full payback in four years time in monitory terms, whereas good services is added value and if the project cannot delivery ROI in 4 years then it is unlikely to proceed.	As an ROI, significant improvement was seen in the service delivery with logging approximately 13,000 jobs due to integration. Moreover, comparing the pre business processes with the post integration processes, the borough estimates a vital improvement in the next 12 months.
	Cost	Very important factor in this project but has acted as a blocker in stead of enabler.	Important but an issue because if integration projects not well implemented then it increases implementation cost.	Has been an important factor but cost is clearly out weight by the benefits in terms of the efficiency gained from this project.	Several costs were identified during EAI adoption process e.g. cost of training staff for developing EAI skills, maintenance cost etc.
	Central Government Grant	Central government provides grants to improve to integrated services to citizens and planning process.	The better the functioning of the borough, then central government gives more grants to work on other integration projects.	To support the community, central government provides sufficient grants and funding to improve to integrated services to citizens.	–

Table 6.4: Analysis of the Revised Financial Factors across the Case Organisations

	Factors	EAI Demonstration Pilot Project	e-Forms & CRM Integration Project	DIS and SAP Integration Project	SoftVendor and CRM System
Organisational Factors	Centralisation	Important factor as integration cannot be done without the support from the head of the department.	Although not an important factor but the decision was centralised by the head of ICT to adopt an EAI solution.	Important as without the authority making person, standards cannot be embedded and followed in the organisation.	Very important factor as without the authority of single person data standards cannot be embedded in the organisation.
	Managerial Capability	Important factor but some managers have been resistant. Borough has put a training program to change the approach in the way all managers work. Every manager passes via the training program.	Very important due to their competency and skills but there has been a substantial lack of competency regards to IT among managers and there is a need for corporate level competencies within the managers.	An important driving factor behind this project and empowering the managers for making local decisions within the guidelines and this in turn will further improve the capability of the managers.	An important driving factor behind this project for EAI adoption.
	Barriers	Several barriers were experienced during the EAI adoption.	Several barriers were experienced during the EAI adoption with silo mentality as an important barrier.	Several barriers were experienced during EAI adoption with resistance to change a major barrier.	Several barriers identified during EAI adoption with among others lack of EAI skills a major barrier.
	Benefits	Several benefits influenced CICTD to adopt EAI including flexibility of workplace and improved data reporting to central government as important benefits.	Several benefits influenced CSD to adopt EAI including efficiency of business processes, reliable data transfer, increase in flexibility of systems and support in reducing citizen's data errors as important benefits.	Several financial, organisational, operational, strategic and technological benefits were identified while adopting EAI e.g. flexibility in working, managing IT infrastructure, access to services more quickly, making information standards much easier.	Several benefits influenced the borough to adopt EAI including efficiency of business processes, reliable data transfer, increase in flexibility of systems and support in reducing citizen's data errors as important benefits.
	Formalisation	Did not follow any formalised procedures for EAI-DPP thus *NOT VALIDATED* (see Table 5.33).	Pressure from head of ICT to have standardisation in work processes across the department.	Formalisation has influenced their decision to adopt EAI as the department believes that EAI will help us in achieving IS020000.	Formalisation has influenced their decision to adopt EAI as there was pressure from the HICT to have standardisation in the work processes.
	Organisational Size	Not only organisational size because there are a number of boroughs that are investing in integration and even though they are smaller as they all believe that it is right route to go towards in providing better services and improving their performance.	It is not only the organisational size but also the amount of resources, the capital the borough has and the amount of funding the borough gets from the central government. This factor has influenced the decision to adopt EAI.	Not only organisational size as there are a number of boroughs that are investing in integration and even though they are lots smaller because they all believe that it is right route to go towards in providing better services and improving their performance.	It is not only the organisational size but also the amount of resources, the capital the borough has and the amount of funding the borough gets from the central government. This factor has influenced the decision to adopt EAI.
	Community Size	It is not just size of the community but also the demographic that matters, so the poorer and diverse the community is, the more funding the borough gets from central government.	It is also not just size of the community but also the demographic that matters, what type of community the borough is serving i.e. the poorer and diverse the community is, the more funding the borough gets from central government.	An important factor as a large part of the resources is driven by the size of community. Funding from the central government depends on community size as more the community the more funding borough gets.	An important factor as a large part of the resources is driven by the size of community. Funding from the central government depends on community size as more the community the more funding borough gets.

Table 6.5: Analysis of the Revised Organisational Factors across the Case Organisations

6.3.1.1 Revising Existing EAI Adoption Factors in the Case Organisations

In this section, the researcher revises the existing factors (Figure 3.2) based on the empirical research conducted in the case organisations (Sections 5.2, 5.3 and 5.4).

- **Project Champion:** The empirical findings from the case organisations illustrate that project champion plays a significant role while adopting technological solutions (Table 6.1). Among other factors, project champion has been an important factor throughout the adoption lifecycle phases (with few exceptions to conception and adoption decision phases) within the case organisations (Table 6.6). Interviewees at LGA_A CICTD and LGA_A CSD highlighted that project champion was amongst the most important factors influencing EAI adoption (see Tables 5.3 and 5.18). The interviewees at LGA_A CICTD also reported that project champion was the driving force behind the EAI adoption process, whereas, the interviewees in LGA_A CSD reported that an important attribute of the project champion i.e. the political influence was also a driving force for EAI adoption. For LGA_B and LGA_C, project champion has also been a key person that has taken the senior lead in promoting their projects (see Tables 5.35 and 5.52 respectively).

  Thus, the empirical findings illustrate that project champion has actively and vigorously promoted and led the projects over or around approval and implementation hurdles within the three case organisations. These findings are in accordance with the literature findings (Somers and Nelson, 2004; Garfield, 2000; Norris, 1999), which represent project champion as an important factor and its existence in the organisations is one of the most important facilitators in the adoption, implementation and dissemination of technologies. While prioritising the importance of project champion factor on the adoption lifecycle phases, the level of importance varies across the adoption lifecycle phases within each case organisation. As summarised in Table 6.6, project champion factor can be considered as one of the most important factors throughout the adoption lifecycle phases with exceptions to adoption phases, where it appears to have moderate importance. The numerics illustrate the importance of this factor (and others) by each case organisation.

		Adoption Lifecycle Phases			
	Case Organisation	**Motivation**	**Conception**	**Proposal**	**Adoption Decision**
Project Champion	LGA_A – CICTD	(2)	(6)	(2)	–
	LGA_A – CSD	(1)	–	(1)	(11)
	LGA_B	(1)	(1)	(4)	(12)
	LGA_C	(2)	–	(4)	(3)

Table 6.6: Importance of Project Champion Factor

- **Citizen Satisfaction:** The empirical findings illustrate that the rapid changes taking place in the case organisations i.e. pressure from the central government, have prompted these organisations to pay more attention to their citizen's satisfaction through better service delivery (Table 6.1). According to the interview discussions and observations, citizen's satisfaction is reported as an important factor in LGA_A CICTD, LGA_A CSD and LGA_C (see Tables 5.3, 5.18 and 5.52). For example, in LGA_A CICTD the interviewees highlighted that to provide citizens with integrated services, the department integrated their systems and storing the data in a single system. This was to provide ease to the citizens who can make several requests in a single contact point and not visiting other departments. Similarly, for LGA_A CSD, the interviewees reported that to provide citizens with ease in online payments for different services i.e. green waste bin service, bulky item collection etc, LGA_A CSD implemented this project.

For LGA_B, citizen's satisfaction factor was not validated (see Table 5.35). The reason is that the project conducted in LGA_B was related to the employees and managers and not the citizens. While, for LGA_C citizen's satisfaction factor was reported as a relatively less important factor. Empirical findings validate the literature findings (Kim and Bretschneider, 2004; Welch *et al.,* 2004; Moon, 2003), which suggest that emerging IT tools appear to offer a useful opportunity to LGAs to enhance citizen satisfaction by improving procedural transparency, cost-efficiency and effectiveness. Though, it also suggests that it all depends how IT applications are integrated in the local government authorities. Furthermore, it suggests that the more integrated systems will result in the higher rating of LGA in citizen's satisfaction (Beynon-Davies, 2005; Welch *et al.,* 2004; Moon, 2003). While prioritising the importance of citizen's satisfaction factor on the adoption lifecycle phases, the level of importance varies across the adoption lifecycle phases within each case organisation with exceptions to conception and adoption decision phases. As summarised in Table 6.7, citizen's satisfaction factor can be considered as an important factor on the motivation phase, whereas, in the proposal and adoption decision phase it has moderate importance.

		Adoption Lifecycle Phases			
	Case Organisation	**Motivation**	**Conception**	**Proposal**	**Adoption Decision**
Citizen's Satisfaction	LGA_A – CICTD	(4)	–	(15)	–
	LGA_A – CSD	(2)	–	–	–
	LGA_B	–	–	–	–
	LGA_C	(9)	–	(11)	(11)

Table 6.7: Importance of Citizen's Satisfaction Factor

- **Critical Mass:** The empirical findings exhibit that critical mass as a factor played an important role in the case organisations i.e. LGA_A and LGA_C, whereas for LGA_B, this factor was not validated. Among other factors, critical mass has been relatively an important factor on the early phases of the adoption lifecycle phases (with exceptions to proposal and adoption decision phase) within the case organisations (Table 6.8). The interviewees within LGA_A CICTD reported that the decision makers decide based on their business needs that in which area they want to be leaders (see Table 5.3). For example, while adopting technological solutions CICTD look for critical mass i.e. when they want to be a leader and where they are laggards, they wait for others and wait for the outcome. However, for EAI-DPP, the researcher observed that CICTD are leaders as they consider their authority as the first to have worked on an integration project and demonstrated to others. Similarly, in LGA_A CSD, interviewees investigated and analysed the solutions of other authorities, thus indicating that critical mass as a factor has been an influential factor for EAI technological solution adoption (see Table 5.18).

In the case of LGA_B, critical mass was not validated (see Table 5.35). The reason is that LGA_B do not look at what other local authorities are doing and consider themselves as the leaders in the integration area, nevertheless, the interviewees mapped and prioritised the importance of critical mass as a factor on the adoption lifecycle phases (with exception to adoption decision phase). For LGA_C, critical mass has been the reported as less important factor on the adoption lifecycle phases (see Table 5.52). According to literature findings, critical mass is an important factor and with its existence, organisations are (directly or indirectly) affected by the actions of other organisations or sometimes one organisation may encourage or coerce its neighboring organisation to adopt a specific technology (Akbulut, 2002; Chwelos *et al.,* 2001; Bouchard, 1993). While prioritising the importance of critical mass factor on the adoption lifecycle phases, the level of importance varies across the adoption lifecycle phases within each case organisation. As summarised in Table 6.8, critical mass factor can be considered as a fairly important factor in the early phases whereas, either no or moderate importance in the later phases.

		Adoption Lifecycle Phases			
	Case Organisation	**Motivation**	**Conception**	**Proposal**	**Adoption Decision**
Critical Mass	LGA_A – CICTD	(6)	(5)	–	–
	LGA_A – CSD	(5)	(5)	–	–
	LGA_B	(9)	(5)	(4)	–
	LGA_C	–	–	(14)	(11)

Table 6.8: Importance of Critical Mass Factor

- **Market Knowledge:** The empirical findings from the case organisations exhibit market knowledge factor as 'market research' i.e. the case organisations assess what their neighboring local authorities are doing regarding technological developments. Moreover, local authorities are reactive as compared to the private organisations that are proactive for any IT related development within their organisations (Table 6.1). In the case of LGA_A CICTD, there was lack of knowledge and understanding on EAI technological solutions. The interviewees exemplified that because there was no expertise and knowledge in this area, they were unable to proceed in their project on their own. Thus, the EAI-DPP project team was supported by the Softcom (their software vendor) with all the required expertise and knowledge on EAI for their pilot project. This indicates that market knowledge factor indirectly influenced the decision making process for EAI adoption within CICTD (see Table 5.3). Similarly in LGA_A CSD, the project team and ISC experts did market research for the comparison of different integration solutions for their project. Thus, it can be said that market knowledge as an influential factor indirectly influenced their decision for EAI technological solution adoption in LGA_A CICTD and CSD (see Table 5.18).

For LGA_B, market knowledge has been one of the most important factor (see Table 5.35). For example, the head of IT reported that the local authorities need to be aware of what is available in the market related to a particular technology. The reason is that if the local authority does not have market knowledge then they may not be able to achieve the business benefits. For LGA_C, market knowledge as a factor is also represented as an important factor (see Table 5.52). The interviewees reported that possessing market knowledge on technological solutions is important to proceed in any project. Therefore, this validated that market knowledge factor in the process of EAI adoption has an important role. The results in Table 6.9 highlight that importance of market knowledge factor on adoption lifecycle phases. It is clear from the results in Table 6.9 that market knowledge factor either influences at the conception or proposal phase and not on motivation or adoption decision phase in all the case organisations.

		Adoption Lifecycle Phases			
	Case Organisation	**Motivation**	**Conception**	**Proposal**	**Adoption Decision**
Market Knowledge	LGA_A – CICTD	–	(4)	–	–
	LGA_A – CSD	–	–	(10)	–
	LGA_B	–	(8)	–	–
	LGA_C	–	(9)	(6)	–

Table 6.9: Importance of Market Knowledge Factor

- **Evaluation Framework:** Empirical findings from the case organisations indicate that the evaluation framework for the assessment and the selection of integration technologies and packages represents a relatively less important factor for EAI adoption. Case study data indicate that one case organisation went through several criteria for the assessment of EAI solutions, whereas, others simply relied on the expertise of the external consultants and vendors that assisted the case organisations in identifying different technologies that best supported their integration needs (Table 6.2). For example, in LGA_A CICTD, the EAI-DPP project team did not follow any evaluation framework, in stead relied on the expertise of their external consultant to provide technical support regarding the decision of selecting the right integration technology. However, CICTD and their external consultants formulated specific criteria that best met the requirements of the integration problem i.e. to run a pilot project and integrate few systems (see Table 5.3). LGA_A CSD was also supported by their consultant i.e. ISC, for evaluating different EAI solutions for their e-Forms and CRM integration project (see Table 5.18).

In LGA_B, the project team visited different suppliers that could meet their integration needs. The need for integration was to provide real time information for all employees and managers. Integration of DIS with SAP modules was assisted by their existing supplier CompuSoft-1 (see Table 5.35). In case of LGA_C, the project team did not hire any consultant for their integration needs, instead they wanted to use the technologies they already had and had expertise and skills on. So basically LGA_C did not wanted to go and procure another solution that may have cost us lots of money (see Table 5.52). All these empirical findings illustrate that although the case organisations have not applied a specific evaluation framework to evaluate EAI but assessing EAI solutions in their own specific ways represents it as an important factor. The results in Table 6.10 highlight that importance of evaluation framework factor on adoption lifecycle phases. It is clear from the results that evaluation framework factor does not influence at the adoption decision phase, whereas in the initial three phases, the results vary for the evaluation framework factor for LGA_B and LGA_C.

		Adoption Lifecycle Phases			
	Case Organisation	**Motivation**	**Conception**	**Proposal**	**Adoption Decision**
Evaluation Framework	LGA_A – CICTD	–	–	–	–
	LGA_A – CSD	–	–	–	–
	LGA_B	(11)	–	(2)	–
	LGA_C	(8)	(6)	(5)	–

Table 6.10: Importance of Evaluation Framework Factor

- **Technological Risks:** EAI is characterised as a set of integration technologies in the normative literature. In this thesis, technological risks as a factor is related to EAI adoption risks in the case organisations (see Table 6.2). Several EAI adoption risks were reported, however, the researcher notes that the most important risk was that LGA_A CICTD fully relied on Softcom with experience on IT projects but with no clear view on the integration of EAI packages (see Table 5.3). Although, in this case study EAI-DPP was successful, the decision for selecting EAI could have been the other way round. Similarly, in LGA_A CSD, technological risks as a factor was relatively an important factor. The interviewees reported several risks e.g. among other risks of not being able to identify EAI benefits, selection of supplier for EAI products (see Table 5.18).

In LGA_B, technological risk as a factor was given least importance than other factors, as it was not validated (see Table 5.35). However, the interviewees also mapped and prioritised this factor on adoption lifecycle phases. In LGA_C, interviewees reported technological risks factor as one of the most important (see Table 5.52) with few EAI technological risks such as: EAI may not be able to deliver the benefits, EAI may not work, lack of EAI skills and cost. Therefore, all these findings confirm that the EAI technological risks represent a factor during the selection and assessment process of EAI technologies. Findings from these case organisations are along similar lines with Ebrahim and Irani, (2005) and Gil García and Pardo, (2005) that highlight the importance of understanding and reducing technological risks as a high priority. The results in Table 6.11 highlight that importance of technological risks factor on adoption lifecycle phases. It is clear from the results in Table 6.11 that technological risks factor does not influence at the motivation phase, whereas in the later three phases, the prioritisation results vary for the technological risks factor for each case organisation.

		Adoption Lifecycle Phases			
	Case Organisation	**Motivation**	**Conception**	**Proposal**	**Adoption Decision**
Technological Risks	LGA_A – CICTD	–	(7)	(4)	(5)
	LGA_A – CSD	–	–	(2)	(3)
	LGA_B	–	(13)	(9)	(7)
	LGA_C	–	–	(7)	(4)

Table 6.11: Importance of Technological Risks Factor

- **IT Infrastructure:** The evidence from the empirical data suggests that the IT implementation decision in all the three case organisations went through several phases. IT infrastructure of all the case organisations, along with each of their departments was heterogeneous and consisted of several incompatible systems. Consequently, the case organisations faced significant integration problems while working with other departments, other government bodies and stakeholders. Thus, it was difficult for these case organisations to integrate all the applications that run on the mainframe and the non-mainframe platforms. In addition, there was a redundancy of data and functionality as many applications stored similar data or ran systems overlapping in functionality. As a result, the case organisations could not take the advantage of IT and support closer collaboration with their various stakeholders and consequently, they faced significant integration problems. Since integration could not be achieved, the limitations of their IT infrastructure motivated the case organisations for EAI adoption (see Table 6.2).

Thus, the IT infrastructure represents an influencing factor for the adoption of EAI in all three case organisations (see Tables 5.3, 5.18, 5.35 and 5.52). These findings are in accordance with the literature findings (Bradford and Florin, 2003; Waarts *et al.*, 2002) that presents existing IT infrastructure as a factor for the adoption of different integration technologies in various types of organisations e.g. public sector to private sectors and SMEs to large organisations. While prioritising the importance of IT infrastructure factor on the adoption lifecycle phases, the level of importance varies across the adoption phases within each case organisation. As summarised in Table 6.12, IT infrastructure factor can be considered as a factor with moderate importance.

		Adoption Lifecycle Phases			
	Case Organisation	Motivation	Conception	Proposal	Adoption Decision
IT Infrastructure	LGA_A – CICTD	–	(11)	(11)	–
	LGA_A – CSD	(6)	(3)	(8)	–
	LGA_B	–	(10)	(14)	(11)
	LGA_C	–	(5)	(10)	–

Table 6.12: Importance of IT Infrastructure Factor

- **Personnel IT Knowledge:** Literature indicates that the availability of sufficient skills set in organisational personnel is an important factor that may constraint or facilitates the introduction of new technologies. Empirical findings from LGA_A CICTD, LGA_A CSD, LGA_B and LGA_C, illustrate personnel IT knowledge as an important factor influencing EAI adoption (see Table 6.2). For example, LGA_A CICTD project team relied on Softcom technical expertise and knowledge to develop and integrate their IT infrastructure. The interviewees also reported that to move from legacy systems to modern systems then there is a need to train the staff to have the sufficient knowledge on how the systems work together. Similarly, when organisations attempt for real time integration then the organisations need to have the skills on how to use the latest integration technologies (see Table 5.3).

LGA_A CSD was also supported by their integration solution consultant in terms of technical expertise and knowledge (see Table 5.18). However, in case of LGA_B and LGA_C, the interviewees ranked this factor as the most important (see Tables 5.35 and 5.52). This is because the interviewees realised how important it is have skilled staff, additionally, the project team at LGA_C wanted to develop the project quickly and on time so for this reason they used their in-house skilled staff expertise. This was meant to better able to support the systems, as it is better value for money. These findings are in accordance with the literature that report that one of the most important factors in the adoption of computer applications by LGAs is staff competence (Perry and Danziger, 1980). This also validates the literature that in the government organisations employees are not very well trained in using information technologies and this inadequate training resulted in resistance to change, resistance to use, and under utilisation of computers (Norris, 1999). While prioritising the importance of personnel IT knowledge factor on the adoption lifecycle phases, the level of importance varies across the adoption phases within each case organisation. As summarised in Table 6.13, personnel IT knowledge factor can be considered as an important factor on the adoption lifecycle phases.

		Adoption Lifecycle Phases			
	Case Organisation	**Motivation**	**Conception**	**Proposal**	**Adoption Decision**
Personnel IT Knowledge	LGA_A – CICTD	–	(6)	(8)	(6)
	LGA_A – CSD	–	(2)	(5)	(4)
	LGA_B	(7)	(6)	(12)	–
	LGA_C	(3)	(2)	(17)	–

Table 6.13: Importance of Personnel IT Knowledge Factor

- **IT Sophistication:** Themistocleous (2004) reported that IT sophistication is related to the level of understanding and addressing technical problems within the organisation. The empirical data as exemplified in Tables 5.3, 5.18, 5.35 and 5.52 indicate that case organisations have rated IT sophistication factor comparatively a less important. However, yet still the level of IT sophistication in all the three case organisations affected the decision making process for EAI adoption. The analysis of the case organisations indicates that there was lack of skilled employees with lack of knowledge on EAI to understand integration problems or technologies. As a result, LGA_A CICTD hired the services of their external consultant and the vendor organisation to improve the IT sophistication. LGA_A CSD was also supported by their integration solution consultant to improve their IT sophistication. Thus, IT sophistication is an influencing factor for the adoption of EAI. The empirical findings confirm IT sophistication as a factor for EAI adoption that is in according to the literature findings (Themistocleous, 2004; Chwelos *et al.*, 2001), which suggest that IT sophistication is an influential factor for the adoption of integration technologies such as EDI and EAI. While prioritising the importance of IT sophistication factor on the adoption lifecycle phases, the level of importance varies across the adoption phases within each case organisation. As summarised in Table 6.14, IT sophistication factor can be considered as an important factor throughout the adoption lifecycle phases with exceptions to proposal phases, where it has moderate importance.

		Adoption Lifecycle Phases			
	Case Organisation	**Motivation**	**Conception**	**Proposal**	**Adoption Decision**
IT Sophistication	LGA_A – CICTD	–	(3)	(7)	–
	LGA_A – CSD	(4)	(1)	–	–
	LGA_B	(3)	(2)	(10)	(4)
	LGA_C	–	(1)	(18)	–

Table 6.14: Importance of IT Sophistication Factor

- **Data Security and Privacy:** Empirical findings illustrate that data security and privacy as a factor influencing EAI adoption was reported as a vital factor for EAI technological solutions adoption (see Table 6.2). Access to citizen's data in a distributed environment is a problem, and thus this raised several vital questions during the interview session e.g. who has and/or can access to citizen's data, do we need to consult with the citizen for their consent to be able to share their data with other department, and how it is secured. As the technology is threatened by potential unauthorised external access, such as by computer hackers who have been known to tap illegally into private information on computer networks, and who could possibly gain access to and even alter citizen's records. Therefore, in this case LGA_A CICTD has set up a citizen's data security group that strictly follow the rules of the data protection act. The interviewees at CICTD reported that data security and privacy influenced their decision to adopt EAI as due to the data protection laws set, CICTD has to provide information within time and this is accomplished through EAI (see Table 5.3).

In LGA_A CSD, including among few other factors data security and privacy was reported as an important factor by the interviewees (see Table 5.18). The reason is that data security and privacy was one of the most important problems to meet because citizens' data contained important information. For LGA_B, the interviewees reported data security and privacy as one of the most important factor (see Table 5.35) as EAI assisted the department to secure data related to staff (in the context of this case organisations data security and privacy is specifically related to employees and managers data). In case of LGA_C, the interviewees mutually agreed that there was a need for technological solution that can assist in providing data security and privacy. Despite these conceptions, the interviewees reported data security and privacy as a factor with moderate importance (see Table 5.52). The results in Table 6.15 highlight the importance of data security and privacy factor on adoption lifecycle phases. While prioritising the importance of data security and privacy factor on the adoption lifecycle phases, the level of importance varies across the adoption phases within each case organisation. As summarised in Table 6.15, data security and privacy factor can be considered as an important factor on the motivation, conception and adoption decision phases whereas with moderate importance in the proposal phase.

		Adoption Lifecycle Phases			
	Case Organisation	Motivation	Conception	Proposal	Adoption Decision
Data Security and Privacy	LGA_A – CICTD	(7)	(9)	(17)	–
	LGA_A – CSD	(3)	(4)	(9)	–
	LGA_B	–	–	(13)	–
	LGA_C	–	(4)	–	(6)

Table 6.15: Importance of Data Security and Privacy Factor

- **Top Management Support:** Empirical findings and literature findings illustrate a commonality of view towards the role of top management in the organisations and the support from the top management has been recognised as one of the most important elements necessary for the successful implementation of integration technologies and integrated packages. In all the three case organisations, support from the top management has been substantial throughout their respective projects (see Tables 5.3, 5.18, 5.35 and 5.52). These empirical findings are in accordance with the literature findings (Kamal and Themistocleous; 2006; 2007; Nah *et al.,* 2001; Bingi *et al.,* 1999), which report that the sustained top management support as the most important factor in technology adoption projects, in addition, as the project progresses, active involvement of top management remains critical in constantly monitoring the progress of the project and providing direction to implementation teams. These findings also indicate that top management support as a factor has influenced EAI adoption in the case organisations. The results in Table 6.16 highlight the importance of top management support factor on adoption lifecycle phases. While prioritising the importance of top management support factor on the adoption lifecycle phases, the level of importance less varies across the adoption phases as this factor has been reported as the most important factor within each case organisation. As summarised in Table 6.16, top management support factor can be considered as one of the most important factor on the adoption lifecycle phases with exceptions to where it was not prioritised by the case organisations.

		Adoption Lifecycle Phases			
	Case Organisation	**Motivation**	**Conception**	**Proposal**	**Adoption Decision**
Top Management Support	LGA_A – CICTD	(1)	–	(6)	(1)
	LGA_A – CSD	(7)	–	–	(1)
	LGA_B	–	(4)	–	(3)
	LGA_C	(4)	–	(2)	(2)

Table 6.16: Importance of Top Management Support Factor

- **IT Support:** Literature indicates IT support as an important factor during the adoption of various integration technologies (Themistocleous, 2004; Sumner and Holstetler, 1999). Empirical findings illustrate that the case organisations' IT departments were lacking skilled staff with knowledge of EAI. The reasons are: (a) EAI is a new emerging technology in the local government domain and (b) there is a market place confusion regarding this emerging technology. Thus, LGA_A CICTD, LGA_A CSD and LGA_B were supported by their respective consultants and suppliers/vendors to support them in the selection of a specific EAI solution suitable for their integration problem. In case of LGA_C, the project team mostly used their in-house expertise for integration of their CRM and SoftVendor system. These empirical conceptions confirm the literature findings that suggest that during the EAI adoption process, organisations acquire external support from their consultant and vendors for the selection of the right integration solutions suitable for their integration problem (Sumner and Holstetler, 1999).

The results in Table 6.17 highlight the importance of IT support factor on adoption lifecycle phases. While prioritising the importance of IT support factor on the adoption lifecycle phases, the level of importance significantly varies across the adoption phases with exceptions to motivation phase, where IT support factor did not influence the case organisations. As summarised in Table 6.17, IT support factor can be considered as a factor with moderate importance on conception, proposal and adoption decision phases with exception to LGA_A CICTD where it was reported as the most important factor.

	Case Organisation	Adoption Lifecycle Phases: Motivation	Conception	Proposal	Adoption Decision
IT Support	LGA_A – CICTD	–	(1)	(9)	(9)
	LGA_A – CSD	–	(5)	(11)	(10)
	LGA_B	–	(14)	(4)	–
	LGA_C	–	(8)	(15)	(7)

Table 6.17: Importance of IT Support Factor

- **Higher Administrative Authority Support:** Literature indicates that support from higher administrative authority has been highly influential for technology adoption process and its utilisation. In the context of the case organisations, the empirical data and interview sessions illustrate that was support as well as pressure from HAA while adopting integration solutions and improving services and sharing of information respectively. HAA support as a factor influencing EAI adoption has been important in all the case organisations (see Table 6.3). For example, in LGA_A CICTD, there was support to work on the EAI-DPP project and evaluate the outcome. On the other hand, CICTD was also influenced by HAA to improve services to citizens and information sharing with other departments and LGAs (see Table 5.3). At LGA_A CSD, there was support and pressure from the HAA to improve services and share data with other departments (see Table 5.18). According to LGA_B and LGA_C, HAA support was reported as moderately important (see Tables 5.35 and 5.52). Higher administrative authorities supported LGA_B and LGA_C for providing integrated services.

The researcher notes that perceiving HAA support as less important to top management support can be attributed: (a) to the distinct working environment of LGA_B and LGA_C, (b) considering the type of support from HAA was different LGA_B and LGA_C e.g. funding, and that (c) some LGAs other than LGA_B and LGA_C may perceive HAA support as indirect and top management support as direct. Nevertheless, the empirical findings suggest that HAA support has influenced the case the organisations (if not directly) for EAI adoption. These findings are in accordance with the literature findings (Kim and Bretschneider, 2004; Moon and Bretschneider, 1997), which report that even in the case that IT managers initiate technology adoption, support from higher administrative authorities may play a significant role. The results summarised in Table 6.18 highlight the importance of HAA factor on adoption lifecycle phases. While prioritising the importance of HAA factor on the adoption lifecycle phases, the level of importance varies with exceptions to LGA_A CSD, where HAA factor influenced only at the adoption decision phase. As summarised in Table 6.18, the analysis of the importance of HAA factor indicate this as a factor with moderate importance.

	Case Organisation	Adoption Lifecycle Phases			
		Motivation	Conception	Proposal	Adoption Decision
Higher Administrative Authority	LGA_A – CICTD	(7)	(10)	(12)	(10)
	LGA_A – CSD	–	–	–	(7)
	LGA_B	(12)	–	(4)	(5)
	LGA_C	(7)	–	–	(9)

Table 6.18: Importance of Higher Administrative Authority Factor

- **Return on Investment:** Literature indicates that technology budgets are sometimes much lower in the local government domain and, LGA budgets are often reduced and sometimes allocated with appropriations (Ward and Mitchell, 2004; Wagnar and Antonucci, 2004). Moreover, LGA officials also do not know whether and to what extent they should invest in EAI and they are unable to assess ROI (Janssen and Cresswell, 2005). LGA_A CSD did not assess ROI, thus it was not validated through their project (see Table 5.18), whereas, the empirical findings from LGA_A CICTD indicate that the experiences of the EAI-DPP project would assist them in realising significant ROI, thus indicating ROI as one of the most important factors (see Table 5.3). In LGA_B, the project team expects to realise their ROI in four years time in monitory terms, whereas ROI in terms of delivering good services is added value that they have achieved (see Table 5.35). For LGA_C, significant improvement was seen in the service delivery with logging approximately 13,000 jobs due to integration in terms of ROI (see Table 5.52). The results as summarised in Table 6.19 highlight the importance of ROI factor on adoption lifecycle phases. While prioritising the importance of return on investment factor on the adoption lifecycle phases, the level of importance does not vary much between the case organisations, thus indicating ROI as a factor with more importance.

	Case Organisation	Adoption Lifecycle Phases			
		Motivation	Conception	Proposal	Adoption Decision
Return on Investment	LGA_A – CICTD	–	(13)	(5)	(4)
	LGA_A – CSD	(7)	–	(11)	–
	LGA_B	(4)	–	(1)	(2)
	LGA_C	–	–	(1)	(1)

Table 6.19: Importance of Return on Investment Factor

- **Cost:** Empirical findings indicate that EAI adoption required substantial investment from the organisational funds. The considerable cost of investment had led the case organisations to justify and evaluate the implications of the introduction of EAI. In doing so, indicated that cost is an important factor that influences the adoption of enterprise application integration in the case organisations (see Table 6.4). This finding is in accordance with the literature (Themistocleous *et al.,* 2005; Lee *et al.,* 2003; Puschmann and Alt, 2001), which support that organisations justify their costs before the adoption of a new investment. Case organisations reported that: (a) EAI software cost, (b) cost of training employees on EAI and (c) cost of integration were the major costs. An interviewee at LGA_A CICTD reported that cost is a blocker not an enabler. The reason is that LGA_A CICTD sometimes depend on the funding from the central government. At times when sufficient funding is not available to the authority, the department has to wait. Thus, this validates that cost factor plays a vital role during EAI adoption process.

The results summarised in Table 6.20 highlight the importance of cost factor on adoption lifecycle phases for each case organisation. While prioritising the importance of cost factor on the adoption lifecycle phases, the level of importance reported varies significantly across the case organisations. For example, in LGA_A CICTD, cost is the second most important factor on adoption decision phase, whereas for LGA_A CSD, it is the eleventh most important factor. Similarly, there are varied differences with other case organisations. The difference in importance of cost factor across the case organisations can be attributed to higher preferences on other factors other than cost (specifically for LGA_A CSD that indicate that cost only influenced their decision making process on the adoption decision phase). As summarised in Table 6.20, the analysis of the importance of the cost factor illustrate it as a factor with high importance on the adoption lifecycle phases with exception to conception phase.

		Adoption Lifecycle Phases			
	Case Organisation	**Motivation**	**Conception**	**Proposal**	**Adoption Decision**
Cost	LGA_A – CICTD	–	–	(1)	(2)
	LGA_A – CSD	–	–	–	(11)
	LGA_B	(6)	–	(3)	(6)
	LGA_C	(10)	–	(12)	(8)

Table 6.20: Importance of Cost Factor

- **Centralisation:** This factor represents the decision-making authority in the organisations and encompasses participation in decision-making and authority hierarchy e.g. it can be said that for one authoritative person to be able to represent the whole organisation and take the decision may prove much more persuasive rather than a number of people from the same or different departments representing. Empirical findings illustrate that centralisation factor is an important factor (see Table 6.5). For example, interviewees at LGA_A CICTD and LGA_A CSD reported that it is an important factor as without the support from the head of the department, their respective integration projects were not possible. Whereas for LGA_B and LGA_C, centralisation factor was reported as an important factor. The reason is that without a single authoritative person that is able to make decisions, one cannot embed standards in the organisation. It can be said that the degree of centralisation relatively influences the decision making process for EAI adoption in the organisations. These findings are in accordance with the literature findings (Kamal, 2006; Ebrahim *et al.,* 2004), which represent that decision-making for technology adoption is typically concentrated at top management in public domain. The results as summarised in Table 6.21 highlight the importance of centralisation factor on the adoption lifecycle phases. While prioritising the importance of centralisation factor on the adoption lifecycle phases, the level of importance does not vary much between the case organisations, thus indicating centralisation as a factor with moderate importance with exceptions to LGA_A CSD, where centralisation factor influences the decision makers at the adoption decision phase.

		Adoption Lifecycle Phases			
	Case Organisation	**Motivation**	**Conception**	**Proposal**	**Adoption Decision**
Centralisation	LGA_A – CICTD	–	(12)	(18)	(12)
	LGA_A – CSD	–	–	–	(5)
	LGA_B	–	(11)	(5)	(10)
	LGA_C	–	–	(16)	(12)

Table 6.21: Importance of Centralisation Factor

- **Managerial Capability:** The literature indicates that managerial capabilities are vital for technology adoption (Beaumaster, 2002). However, empirical findings illustrate that managers in the case organisations lacked knowledge on EAI, thus, they were supported by their respective consultants and vendors/suppliers to overcome their integration problems (see Table 6.5). For example, at LGA_A CICTD, managerial capability as a factor influencing EAI adoption was reported as one of the most important factor (see Table 5.3). The researcher observed that the reason for reporting this factor as important is because it was the first attempt by CICTD on the EAI-DPP project among other local authorities. Due to this CICTD project team did not considered themselves to be more aware about the benefits and barriers of the EAI technology. Thus, it can be said that managerial capability factor influenced EAI technological solution adoption at CICTD. At LGA_A CSD, the interviewees also reported that managers are crucial because of their competency and there is substantial lack of competency on IT among managers with reliance on other staff with IT knowledge (see Table 5.18).

In LGA_B, the interviewees reported that managerial capability as a factor for EAI adoption has been one of the drivers behind the project thus, reporting it as a factor with higher importance (see Table 5.35). For LGA_C, the interviewees also considered managerial capability as a factor for EAI adoption as the most important (see Table 5.52). Using in-house expertise and knowledge for the project at LGA_C, illustrates a good level of ability of managers involved in the project. These findings are in accordance with the literature findings (Lam, 2005; Kim and Bretschneider, 2004), which represent that the availability of personnel who have ample competencies for producing new ideas is one of the significant factors for IT adoption. On the other hand, lack of appropriate in-house skills within LGAs is of major concern, including both the management skills needed to manage complex and large-scale integration projects, and the technical skills required to implement integration solutions. The results as summarised in Table 6.22 highlight the importance of managerial capability factor on the adoption lifecycle phases. While prioritising the importance of this factor on the phases, the level of importance does not vary much between the case organisations with exceptions to motivation phase, thus indicating managerial capability as a factor with higher importance.

		Adoption Lifecycle Phases			
	Case Organisation	Motivation	Conception	Proposal	Adoption Decision
Managerial Capability	LGA_A – CICTD	–	(2)	(3)	(3)
	LGA_A – CSD	–	–	(3)	(2)
	LGA_B	–	(7)	(6)	(8)
	LGA_C	–	–	(3)	–

Table 6.22: Importance of Managerial Capability Factor

- **Barriers:** Empirical findings indicate that case organisations experienced several barriers during the EAI adoption process. This supports the literature findings suggesting that introduction of new technologies often presents several barriers that the organisation need to estimate (Themistocleous 2004; Davenport, 1998). As the literature suggests, EAI presents several barriers that the organisation needs to consider before proceeding to EAI adoption. The case study analysis supports this perspective and confirm that barriers as a factor is one of the most significant issues during adoption EAI. LGA_A CICTD experienced several barriers, for example, no evaluation frameworks used to assess EAI tools, lack of EAI knowledge, low level of CICTD IT infrastructure and lack of BPR. It appears that in CICTD lack of knowledge on EAI was a significant barrier. In the case of LGA_A CSD, among others data protection, silo mentality, funding from the central government were the most significant barriers.

For LGA_B, the most important barriers were reluctant to share data, resistance to change, cultural issues and no time for training employees on EAI. While for LGA_C, higher levels of investment in EAI, complexity of business processes and high investment in training staff were among the most important barriers. The results as summarised in Table 6.23 highlight the importance of barriers factor on the adoption lifecycle phases. While prioritising the importance of barriers factor on the adoption lifecycle phases, the level of importance does not vary much between the case organisations with exceptions to proposal phase where the prioritisation of barriers factor by LGA_A CSD significantly differs from other case organisation. The difference in importance of barriers factor across the case organisations can be attributed to higher preferences of barriers factor over other factors in the organisational factor category (specially for LGA_A CSD).

		Adoption Lifecycle Phases			
	Case Organisation	**Motivation**	**Conception**	**Proposal**	**Adoption Decision**
Barriers	LGA_A – CICTD	–	–	(10)	(7)
	LGA_A – CSD	(7)	–	(4)	(6)
	LGA_B	(2)	(12)	(8)	(9)
	LGA_C	(5)	–	(13)	(5)

Table 6.23: Importance of Barriers Factor

- **Benefits:** This factor refers to the level of the benefits that EAI can provide in LGAs. Literature indicates that benefits as a factor during the adoption of various integration technologies such as EDI, EAI and web services (Wu, 2004; Chen, 2003; Kuan and Chau, 2001). The empirical findings reported benefits factor as one of the most important factors (see Tables 5.3, 5.18, 5.35 and 5.52) with several EAI benefits in the case organisations presented in Chapter 5. However, all the benefits are classified using the model proposed by Shang and Seddon (2000) into: (a) operational; (b) managerial; (c) strategic; (d) technical and (e) organisational factor as illustrated in Appendix C in detail. The results as summarised in Table 6.24 highlight the importance of benefits factor on the adoption lifecycle phases. While prioritising the importance of benefits factor on the adoption lifecycle phases, the level of importance does not vary much between the case organisations with exceptions to proposal phase where the prioritisation of benefits factor by LGA_A CICTD significantly differs from other case organisation in this phase. The difference in importance of benefits factor across the case organisations can again be attributed to higher preferences of benefits factor over other factors in the organisational factor category (especially for LGA_A CICTD).

	Case Organisation	Adoption Lifecycle Phases: Motivation	Conception	Proposal	Adoption Decision
Benefits	LGA_A – CICTD	(3)	–	(14)	(8)
	LGA_A – CSD	–	–	(6)	(8)
	LGA_B	(5)	(3)	(7)	(1)
	LGA_C	(1)	(3)	(9)	(5)

Table 6.24: Importance of Benefits Factor

- **Formalisation:** Empirical findings indicate that formalisation factor is a relatively important factor within the case organisations with exceptions to LGA_A CICTD where this factor was not validated (see Tables 5.3 and 6.5). For example, LGA_A CICTD while working on the EAI-DPP project they did not follow any formalised steps for EAI adoption as they relied on the Softcom for supporting in their integration problems. In case of LGA_A CSD, the project team followed their respective formalised ways for selecting EAI solutions. According to the interviewees it is very vital to have standardisation of working in the organisation because it is a key factor for the success of any project (see Table 5.18). For LGA_B and LGA_C, formalisation as a factor was reported as an important factor influencing the EAI adoption process. The interviewees in LGA_B reported that as several formalised steps were followed to adopt EAI solution, this may in turn assist us in achieving IS020000 (see Table 5.35).

In LGA_C, the interviewees said that it is important to have standardisation of working in the organisation (see Table 5.52). These findings are in accordance with the literature findings (Ebrahim *et al.,* 2004; Lee *et al.,* 2003), which represent that formalisation is internal to the organisations that influence the adoption and designing of integrated e-Government applications. The results as summarised in Table 6.25 highlight the importance of formalisation factor on the adoption lifecycle phases. While prioritising the importance of formalisation factor on the adoption lifecycle phases, the level of importance varies between the case organisations. The interviewees at LGA_A CICTD and CSD reported that formalisation factor only influenced at the proposal phase whereas, for LGA_B and LGA_C formalisation factor was prioritised throughout adoption lifecycle phases and on the conception and proposal phases respectively. The analysis of the results illustrate that formalisation factor can be considered as a factor with moderate importance with exceptions to adoption decision where according to LGA_B formalisation is the most important factor in the organisational factor category.

	Case Organisation	Adoption Lifecycle Phases			
		Motivation	Conception	Proposal	Adoption Decision
Formalisation	LGA_A – CICTD	–	–	(16)	–
	LGA_A – CSD	–	–	(7)	–
	LGA_B	(8)	(9)	(11)	(1)
	LGA_C	–	(7)	(8)	–

Table 6.25: Importance of Formalisation Factor

- **Size:** Literature indicates size in terms of size of community served and organisational size (Akbulut, 2002). Community size also refers that the bigger, diverse and poor the community, the borough may get more funding from the central government. Organisational size specifies the amount of resources and capital available to the organisations to justify the adoption of new technology to accommodate variations in input even when variations occur infrequently. In LGA_A CICTD, the interviewees reported size as a factor with moderate importance while making decisions for EAI adoption (see Table 5.3). This may be attributed to that LGA_A CICTD receives less government grant than other neighbouring boroughs and there is a perception amongst councillors and officers that it is low funded borough. In LGA_A CSD, the interviewees reported size as a factor with higher importance during the EAI adoption process. The reason is that the interviewees consider LGA_A CSD as a big local authority and the bigger the organisation, the more operational activities, thus this assists in getting more funding from the central government to work other projects (see Table 5.18). For LGA_B and LGA_C, size as a factor was reported with moderate importance (see Table 5.35 and 5.52). The results as summarised in Table 6.26 highlight the importance of size factor on the adoption lifecycle phases. While prioritising the importance of size factor on the adoption lifecycle phases, the level of importance significantly varies between the case organisations. For example, size factor influenced the decision making process for EAI adoption at LGA_A CICTD throughout the adoption lifecycle phases and not for LGA_A CSD, LGA_B and LGA_C. Thus, the analysis of the results illustrate that size factor can be considered as a factor with moderate importance.

	Case Organisation	Adoption Lifecycle Phases			
		Motivation	Conception	Proposal	Adoption Decision
Size	LGA_A – CICTD	(5)	(8)	(13)	(11)
	LGA_A – CSD	–	–	–	(9)
	LGA_B	(10)	–	–	–
	LGA_C	(6)	–	–	(10)

Table 6.26: Importance of Size Factor

Based on the empirical findings, the aforesaid factors can be classified into factors with top, moderate and least important on adoption lifecycle phases.

Phases	Top Factors	Moderate Factors	Least Factors
Motivation Phase	• Project Champion • Citizen's Satisfaction • Critical Mass • IT Infrastructure • Personnel IT Knowledge • IT Sophistication • Data Security and Privacy • Top Management Support • Higher Administrative Authority • Return on Investment • Cost • Barriers • Benefits • Size	• Evaluation Framework • Formalisation	–
Conception Phase	• Project Champion • Critical Mass • Evaluation Framework • Personnel IT Knowledge • IT Sophistication • Data Security and Privacy • Top Management Support • IT Support • Formalisation	• Market Knowledge • IT Infrastructure • Technological Risks • Higher Administrative Authority • Return on Investment • Centralisation • Managerial Capability • Barriers • Benefits • Size	–
Proposal Phase	• Project Champion • Market Knowledge • Evaluation Framework • Technological Risks • Top Management Support • Higher Administrative Authority • Return on Investment • Cost • Managerial Capability	• Critical Mass • IT Infrastructure • Personnel IT Knowledge • IT Sophistication • Data Security and Privacy • IT Support • Barriers • Benefits • Formalisation • Size	• Citizen's Satisfaction • Centralisation
Adoption Decision Phase	• Technological Risks • Personnel IT Knowledge • IT Sophistication • Data Security and Privacy • Top Management Support • Return on Investment • Cost • Managerial Capability • Barriers • Benefits • Formalisation	• Project Champion • Citizen's Satisfaction • Critical Mass • IT Infrastructure • IT Support • Higher Administrative Authority • Centralisation • Size	–

Table 6:27: Classification of Existing EAI Adoption Factors Based on their Importance on the Adoption Lifecycle Phases

6.3.1.2 New Factors Influencing EAI Adoption in the Case Organisations

In this section, the researcher discusses on the new factors identified by conducting empirical research in the case organisations.

- **Data Consistency:** This factor relates to the pressure factor category. Empirical evidences illustrate that a fundamental requirement in electronic service delivery and making government information available online is the ability for government applications to be able to exchange data in a seamless fashion. Nonetheless, the interviewees from all three case organisations identified a lack of data consistency as an internal technical pressure that has inhibited the integration process at several times. One issue raised from LGA_A CICTD was that the data formats used by one application may be incompatible or non-readable by other applications. Similarly, from LGA_A CSD the interviewees reported data duplication and inconsistencies as a major problem. Another issue raised by interviewees from LGA_B was that data has been unreliable with several inconsistencies, whereas, in LGA_C issue discussed was the structural differences in the way the same concept is represented in different applications, e.g. representation of a citizen's name, address, data of birth etc. Interviewees expressed the need for standardisation in data formats and the adoption of a common data model. It was also noted that when the case organisation departments adopted the same data standards, interoperability across different technology versions appeared to be an issue. This is because there are differences in methodologies and modelling standards. There was also pressure from the top management within and the central government to have standardisation of work processes. These empirical findings illustrate that 'data consistency' as a factor influenced the decision making process for EAI solutions adoption.

- **Project Delivery Timescale:** Project delivery timescale is another a new factor related to the pressure factor category. The interviewees from all three case organisations reported that there was pressure from their senior management to complete and deliver their respective projects on time mainly because the project was needed to go live for either demonstration or for the users and the public. The researcher notes here that an over ambitious nature of top management and their milestones was identified as an issue in delivering projects on time. This highlights a gap between the establishment of strategic milestones and a realistic schedule of implementation and delivering of the projects. For example, literature indicates that large-scale integration projects often exhibit a high level of complexity, involving significance redesign of processes and organizational structures (Themistocleous and Irani, 2001). An interviewee from LGA_A CICTD reported that:

> "... *several times the department is short of staff to carry out day-to-day activities and operations ... due to this we have to take time off from the on-going projects and assist the department in its day-to-day operations ... i.e. we have to prioritise our daily work by giving priority to the projects as well maintain the priority on other day-to-day activities within the departments. This causes delay in the delivery of on-going project* ..."

This empirical finding from LGA_A CICTD illustrates that 'project delivery timescale' as a factor has influenced the decision makers while adopting enterprise application integration solutions.

- **Stakeholder's Pressure:** This factor is related to the pressure factor category. Empirical findings indicate that stakeholders represent an influencing factor for the adoption of enterprise application integration. In the context of the case organisations, the pressure from: (a) government agencies, (b) peers from other departments (c) peers from other boroughs for the provision of better service delivery to the citizens and (d) partner organisations for improvement in close collaboration, represent the external pressures. The pressure for sharing of citizen's information also represents external pressure. In addition, the pressure from citizens for the improvement of facilities such as availability of their records wherever and whenever required to the services providers for better service provision also represent external pressure from the stakeholders. All these external pressures from the stakeholders indirectly influenced the adoption of EAI in these case organisations and represent a decisive factor for EAI adoption. This also confirms the literature findings (Themistocleous, 2004; Bradford and Florin, 2003; Waarts *et al.*, 2002), which present external pressures as a factor for the adoption of different integration technologies.

- **Competition:** This factor is also related to the pressure factor category. Competition here does not mean that the case organisations were competing for monitory purpose as reported by the interviewees. Instead there is competition in terms of being more productive and improving services to community and in turn acquiring more funds from the central government. The interview discussions illustrate that due to the pressure from the central government to achieve the 2005 e-Government targets and enhancement in service delivery, the case organisations perceived the pressure indirectly as competition among other boroughs to provide integrated services. For example in LGA_A CICTD, due to the pressure from the central government to achieve e-Government targets, they worked on the EAI demonstration pilot project to act as exemplar for other boroughs. Similarly, for LGA_A CSD and LGA_C, the pressure from the central government and neighbouring boroughs to be more productive in services delivery and more responsive to citizen queries represented a competitive environment. In case of LGA_B, the interviewees did not prefer to comment on this factor. Literature indicates that increased competition from external business environments has be a source for adopting EAI (Themistocleous, 2002), nevertheless, the empirical evidences from these case organisations illustrate that increased competition is related to improved services to community citizens and being more productive.

- **Stakeholder's Support:** This factor relates to the support factor category. Literature indicates that support factor deals with the vendor and consultant IT support (Themistocleous, 2004; Sumner and Holstetler, 1999). Vendors and consultants may also be characterised as stakeholders, however, the empirical findings suggest that stakeholder support in the case organisations is from (a) neighbouring boroughs to consult on different issues related to e.g. integration, service delivery, shared services, information sharing etc, (b) availability of skilled staff with EAI expertise and (c) general administrative support from within the local authority. LGA_A CSD did not comment on this factor. The researcher points here that alike the present case organisations there may also be a range of different stakeholders for other boroughs that may directly or indirectly influence their decisions for EAI adoption.

- **Central Government Grants:** This new factor relates to the financial factor category. Several issues related to monitory funding from the central government were discussed during the interviews. For example, in LGA_A CICTD an interviewee reported that:

> "... *money, resources and the capability of the processes to support them has always been a constraint while adopting integration solutions* ..."

This is because EAI is a high risk investment, knowing the fact that CICTD lacked knowledge on EAI and the department is reluctant to spend from their available capital and resources. To overcome this constraint CICTD seek central government grants to improve their planning and developing processes. The interviewee also said that when the department gets sufficient funding then it is time to decide what to do and a best example for this is that of e-Government for which all the local authorities received a million £

each to spend on integrated services i.e. target for 2005. This indicates that if all the boroughs receive grants from the central government (for any development project it may be), it improves the financial capability of the borough. In this case, the researcher notes that this is a direct financial influence and an influential factor for EAI adoption in the case organisations. Interviewees from LGA_A CSD and LGA_B also highlighted the importance of central government grants for their EAI related projects: (a) grants for better functioning of the borough and the better the borough is, central government gives more grants to work on other projects and (b) to support the community, central government provides sufficient funding to improve to integrated services to citizens.

The revised proposed factors are illustrated in Figure 6.1.

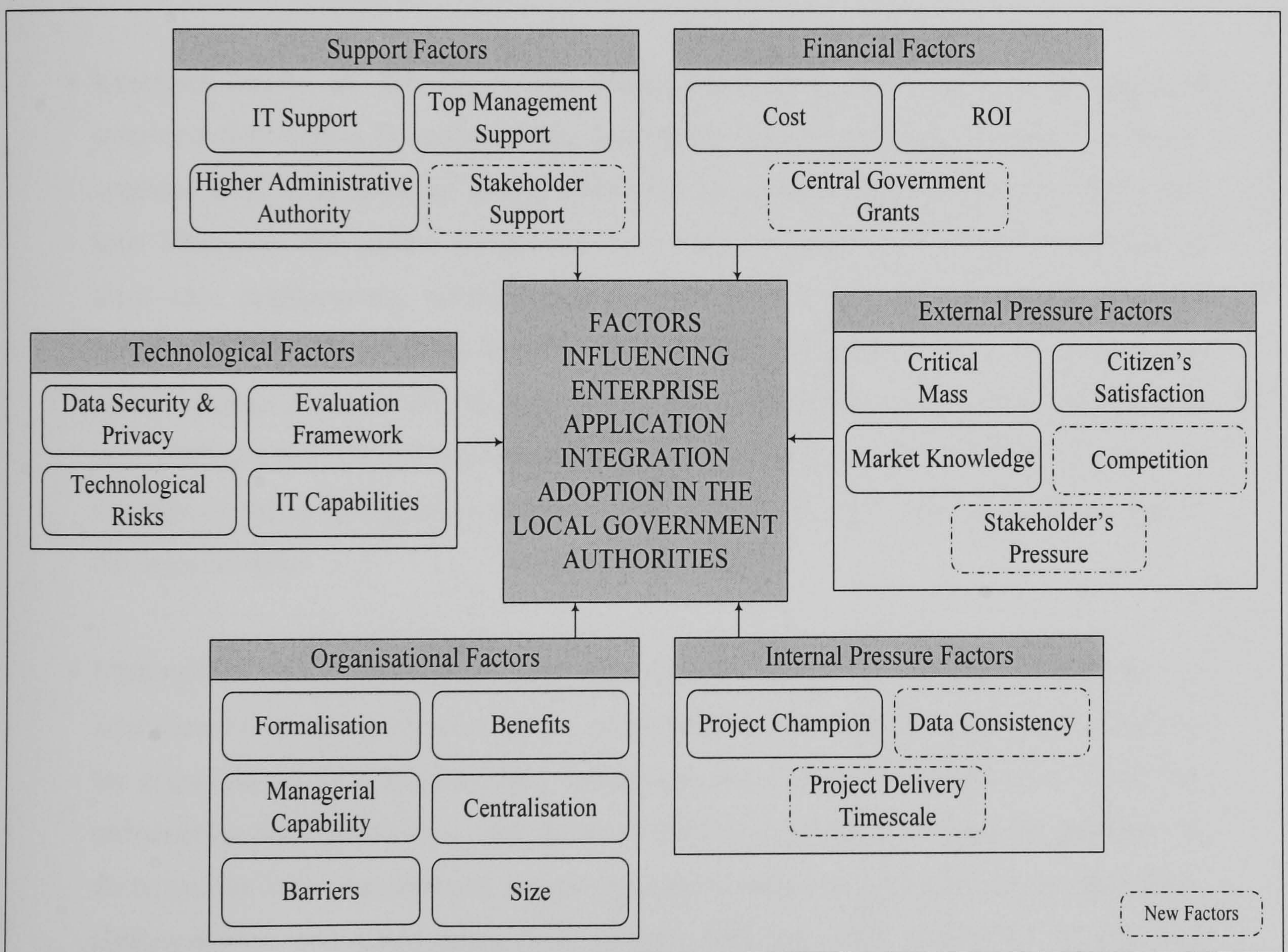

Figure 6.1: Revised Factors Influencing EAI Adoption in LGAs

6.3.2 Findings and Revised Adoption Lifecycle Phases

In this section, the researcher revises and extends the adoption lifecycle phases based on the research conducted in the case organisations. Four new phases were identified from the empirical findings (from LGA_A CICTD and LGA_C): [(a) *external driver* and/or (b) *driving force*], [(c) *discussion* and/or (d) *research phase*]. As explained in Sections 5.2.2.2.2 and 5.4.2.2.2, external driver or driving force phase are prior the motivation phase, discussion and or research phases are prior the proposal phase, whereas, adoption decision phase was also reported with a different term i.e. *investment* phase (Figure 6.2). The empirical findings point out that although LGA_A CSD and LGA_B did not suggest any new phase(s), the new phases put forward by LGA_A CICTD and LGA_C appear to be common in the case organisations. This can be attributed to reasons including among others: (a) each case organisation had several IT infrastructure limitations (Tables 5.1, 5.40 and 5.59), (b) each case organisation was motivated to identify, evaluate and adopt EAI solution suitable for their integration needs. Thus, the aforesaid views highlight the existence of the adoption lifecycle phases in the case organisations (adoption phases with observable appearance during the EAI adoption process).

- **External Driver or Driving Force Phase:** According to the case study data and interview discussions IT infrastructure limitations were significantly evident in the case organisations, as a result of these limitations, their performance and productivity was low. Moreover, the central government was demanding to see a return on investment from case organisations, whereas, citizens were demanding to see improvements in service delivery. The pressure from the central government and citizens is characterised as the *external driver* or *driving force phase* (also support by interviewees). This is also in accordance with the literature findings (Pierce and Delbecq, 1977), which suggest that external driver or driving force illustrates an external/internal pressure to bring change in the organisation.

- **Motivation Phase:** It appears that the external driver or driving force phase is interrelated with the *motivation phase*, as the external driver or driving force influences the organisations to overcome their integration and organisation problem(s). Thus, this influence in turn generates a motivation to identify a solution to solve the problem. In doing so, the case organisations were motivated to adopt an EAI solution for their EAI-DPP, e-Forms and CRM integration project, DIS and SAP integration project and SoftVendor and CRM systems integration projects respectively. This perception is in accordance with the literature findings (Frambach and Schillewaert, 2002; Darmawan, 2001; Rogers, 1983), which represents that motivation occurs when decision-makers are exposed to solution's existence and gain some understanding of how it functions and how it may solve the problem i.e. in other words to develop a business case for the problem and its solution.

- **Conception Phase:** Developing a business case can be characterised as developing an understanding towards the solution – also regarded as persuasion or perception (Agarwal and Prasad, 1998; Rogers, 1983). The motivation phase is followed by the *conception* phase. For instance, in the context of the case organisations, the respective project teams attempted to acquire the in-depth knowledge on the EAI solution (either through the support from their consultant/vendor or using in-house expertise). That is, the project teams developed some views (conceptions) as to how EAI may assist them in solving their problems. This is in accordance with the literature findings (Kamal, 2006; Davis, 1989), which represents that in organisations, conception phase is exhibited by several members creating a favorable or unfavorable attitude towards technology adoption.

- **Discussion or Research Phase:** IT infrastructure is a critical component of an organisation's IT portfolio (Weill, 1993). As highlighted in Tables 5.1, 5.40 and 5.59, each case organisation had their relatively distinct IT infrastructure limitations. Thus, developing an attitude and acquiring knowledge on a specific solution may just not be adequate. For solutions, to overcome IT infrastructure limitations and other integration problems may need further *research* and *discussions* with other members of the project team (as highlighted in Section 5.2.2.2.2). The researcher points here that on doing further research or discussions with other members assisted e.g. LGA_A CICTD in gaining more knowledge and in-depth understanding on the solution from their Softcom. This is because it facilitated the development of a strong case to adopt the solution (i.e. EAI for the demonstration pilot project).

- **Proposal Phase:** According to the empirical findings, the project team members in the case organisations discussed their case (in a proposal format) with their senior management along with the possible outcomes of the projects. This process is characterised as the *proposal* phase i.e. the case organisations made their formal case for adopting EAI solutions for their respective projects and forward it to the decision makers. This is in accordance with the literature findings (Kamal, 2006; Irani *et al.*, 2002; Paul *et al.*, 2000), which suggest that proposal submission is the commencement of a formal technology adoption process i.e. opting to move towards the adoption decision.

- **Adoption Decision Phase:** According to the empirical findings from LGA_A CICTD, *adoption decision* phase is the same as investment phase i.e. once the decision was made; the decision makers proceeded for the investment of the EAI solution for the demonstration pilot project. Although not discussed in the other two case organisations about 'investment' term, however, their project teams also passed through this adoption decision phase of investing in the solution for their respective projects. This is in accordance with the literature findings (Kamal, 2006; Frambach and Schillewaert, 2002), which suggest that once the decision is made, organisations move forward with their investment.

The revised adoption lifecycle phases are summarised in Figure 6.2.

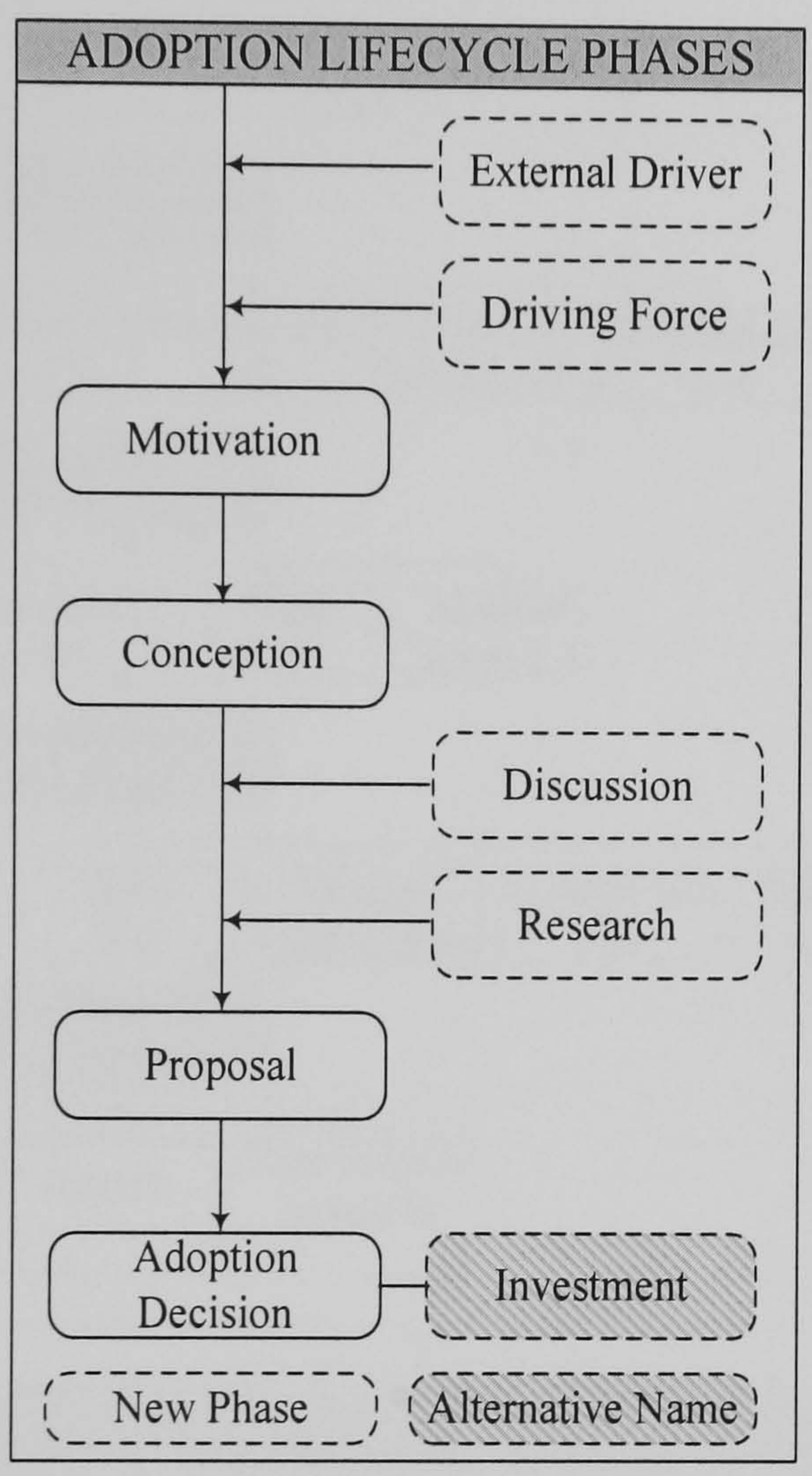

Figure 6.2: Revised Adoption Lifecycle Phases

6.3.3 Revised EAI Adoption Model in LGAs

The empirical findings illustrate that the role of factors, adoption lifecycle phases, mapping of factors and prioritising the importance EAI adoption factors had high importance during EAI adoption process in the case organisations. Thus, the researcher proposes that while exploring EAI adoption in LGAs: (a) identification of factors, (b) identification of adoption lifecycle phases, (c) mapping of factors on adoption lifecycle phases and (d) prioritising the importance of factors on adoption lifecycle phases provides a deeper understanding of interrelationships within LGAs. In doing so, the revised proposed EAI adoption model (Figure 6.3) may: (a) overcome IT infrastructure limitations within LGAs, (b) improve the level of analysis and (c) support LGA decision makers when adopting EAI.

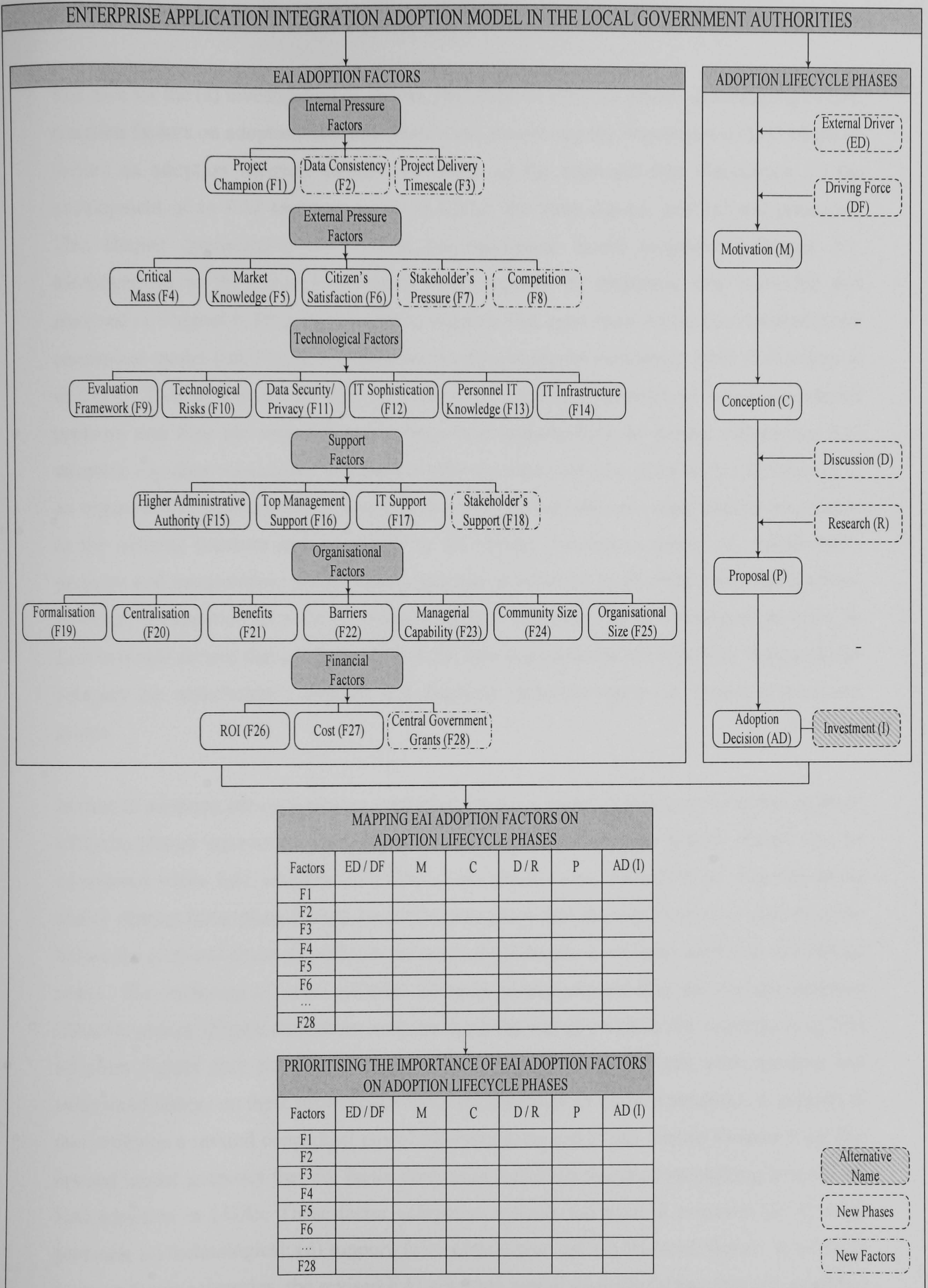

Figure 6.3: Revised Proposed EAI Adoption Model in LGAs (I – Interviewee[s])

6.4 Conclusion

The case for the (a) investigation of factors, (b) adoption lifecycle phases, (c) mapping of EAI adoption factors on adoption lifecycle phases, (d) prioritising the importance of EAI adoption factors on adoption lifecycle phases and based on the aforesaid four dimensions (e) the development of an EAI adoption model in LGAs, has been argued, justified and presented. This chapter concentrated on revising the conceptual model proposed in Figure 3.7. Modifications to the conceptual model were imposed by empirical data presented and analysed in Chapter 5. Empirical evidence suggests that apart from the factors reported in the conceptual model (see Figure 3.2) new factors should also be considered while EAI adoption in LGAs. Two of the new factors identified from empirical research are related to internal pressure and they are reported in all three case organisations as factors influencing EAI adoption e.g. data consistency and project delivery timescale take place within the bounds of an organisation. Another two factors that are derived from the case organisations are related to the external pressure and are added to the revised conceptual model i.e. stakeholder's pressure and competition. Stakeholder's pressure is reported in all three case organisations, however, competition as a factor influencing EAI adoption was not discussed in LGA_B. Last two new factors that are derived from the case organisations are related to support factor category i.e. stakeholder's support and financial factor category i.e. central government grants.

In case of adoption lifecycle phases, empirical evidence suggests that apart from the adoption lifecycle phases reported in the Figure 3.3, new adoption lifecycle phases should also be considered while EAI adoption in LGAs. Four phases were identified i.e. external driver and/or driving force phase before the motivation phase and discussion and/or research phase before the proposal phase. In addition, adoption decision phase was also termed as investment phase. The inclusion of new adoption lifecycle phases depicts that the revised adoption lifecycle phases (Figure 6.2) along with the mapping and prioritising the importance of EAI adoption factors may provide LGA decision makers with an in-depth understanding and analysis of factors on these phases prior to taking the decision for EAI adoption. In support of this evidence a revised conceptual model has been proposed in this chapter (Figure 6.3). The revised model proposes that six factor categories influence the decision making process for EAI adoption in LGAs. These factor categories include: (a) internal pressure; (b) external pressure; (c) technological; (d) support; (e) organisational and (f) financial factors. In addition to these factor categories, the revised EAI adoption model suggests factors that are related to these factor categories. These factors include the following:

- Internal Pressure Factors (project champion, data consistency and project delivery timescale).

- External Pressure Factors (critical mass, market knowledge, citizen's satisfaction, stakeholder's pressure and competition).

- Technological Factors (evaluation framework, technological risks, data security and privacy, IT sophistication, personnel IT knowledge and IT infrastructure).

- Support Factors (higher administrative authority, top management support, IT support and stakeholder's support).

- Organisational Factors (formalisation, centralisation, benefits, barriers, managerial capability, community size and organisational size).

- Financial Factors (return on investment, cost and central government grants).

All these factors lead to better understanding and analysis of the revised EAI adoption model. Thus, they contribute to better decision-making during EAI adoption in LGAs. The novelty of the EAI adoption model presented in Figure 6.3 focuses on the following:

- The model consists of (a) a set of factors influencing EAI adoption in the case organisations and (b) incorporates factors identified separately in previous studies. These factors are used for the development of a consistent model for EAI adoption in LGAs.

- The model incorporates several adoption lifecycle phases. Empirical findings illustrate that the case organisations pass through these phases while adopting EAI.

- The model assimilates the mapping of factors influencing enterprise application integration adoption in the case organisations on the adoption lifecycle phases.

- The model incorporates the prioritisation (importance) of enterprise application integration adoption factors on the adoption lifecycle phases.

- Finally, the model can be used as a tool for decision-making to support LGAs and allow decision makers and researchers to understand and analyse EAI adoption.

7

Chapter 7: Conclusion, Contribution, Limitations and Further Research

Summary

The purpose of this chapter is manifolds: (a) to conclude the research carried out in this thesis, (b) to present its achievements and contributions, (c) to highlight the limitations in the research and (d) to propose areas for further research. Chapter 7 begins by summarising an overview of the research conducted in this thesis and drawing conclusions derived from the literature and empirical findings reported in Sections 7.2 and 7.3. The novelty claimed in this thesis is summarised in Section 7.4. Thereafter, the limitations of this research are identified and presented. The researcher proposes that these limitations should be considered when interpreting results. Finally, this chapter concludes with the identification and discussion of further research directions, in the challenging and fast-evolving research area of enterprise application integration adoption in the local government authorities.

7.1 Research Overview

This thesis started with a background to the research problem in Chapter 1. The normative literature highlights that the local government authorities have widely focused on the use of information systems to overcome their organisational problems and automate their business processes. LGAs also focused on IS to provide direct support to meet citizens' needs including housing, social services, and the management of a complex service infrastructure that supports communities and businesses. However, IS developments within LGAs have resulted in non-integrated IT infrastructures. The reason is that each LGA autonomously made its own IT operation decisions based on its needs. Several integration projects were adopted in LGAs to overcome their integration problems. These projects have not proved productive in LGAs in relation to quality of services, functionality and high costs despite offering several benefits. Thus, LGAs are looking for new means to increase their functional capabilities and reduce cost of integration. Recently, technological developments have emerged in the area of enterprise application integration. EAI provides significant benefits to the organisations to overcome their integration problems and reduce the overall integration cost through reduction of the integration time and maintenance cost.

Literature indicates that there exist few EAI adoption models in the private and public domain (e.g. healthcare sector). These models are not generic and their validity and applicability within LGAs is questionable, however, these models provided some understanding regarding EAI adoption in LGAs. In the context of this thesis, the overall applicability of the existing EAI adoption models cannot provide the same outcome in LGAs. As a result, it was claimed that EAI adoption in LGAs is not given adequate attention in the research literature leading to a number of voids. The research presented in this thesis addressed the growing need to investigate EAI adoption in the local government authorities. Chapter 1 states the aim of this thesis that is to *investigate enterprise application integration adoption in the local government authorities. In doing so, resulting in the development of a model that may assist the local government authorities in their decision making process for EAI adoption*. Thereafter, the objectives are highlighted and finally, Chapter 1 provides a general overview to the thesis outline.

In an attempt to meet the aim and objectives of this thesis, Chapter 2 (background theory) started by reviewing the literature on IT adoption in LGAs. The rationale was to understand and analyse IT adoption in LGAs in the last decades. The analysis led the researcher in identifying several IT infrastructure limitations in the local government authorities as reported in Section 2.2.1. These limitations provided an insight into how LGAs resulted in developing non-integrated IT infrastructures. Thereafter, Chapter 2 provided an analysis of the EAI literature and explained the business and technical perspectives. In Section 2.3, the researcher discussed on the traditional integration approaches compared with EAI (Figure 2.2). The rationale was to emphasize the importance of EAI in integrating IT infrastructures. Subsequently, the researcher critically discussed on EAI business and technical perspectives. These perspectives illustrated how EAI benefits organisations in solving including among others: their organisational and technical problems. In investigating more on EAI adoption, the researcher assessed the current research conducted on EAI adoption in the private and public domain in Section 2.4. The analysis of the EAI adoption literature illustrated that there is lack of EAI adoption models within LGAs and local government officials seek answers for the effect of EAI adoption, for the reason that it will assist them in understanding EAI technological benefits, barriers and costs. Figure 2.5 illustrated the availability of validated EAI and integration adoption studies in other sectors and lack of EAI adoption model in LGAs.

Subsequently, the researcher analysed the current research conducted on EAI adoption in the local government authorities. The analysis of the LGA literature on EAI adoption highlighted that LGAs are laggards in adopting enterprise application integration solutions due to several reasons as reported in Section 2.4.1. Subsequently, assessing the current research on adoption lifecycle phases, mapping and prioritisation of factors involved in the EAI adoption in LGAs. It was argued that despite the fact that the private and public organisation's decision to implement EAI may in fact be the most important development for integrating their heterogeneous IT infrastructures. To the best of the researchers' knowledge, there was lack of broad-based theoretical and empirical research on the mapping and prioritising the importance of factors that influence the decision making process for EAI adoption on different phases of the adoption lifecycle in LGAs. Finally, outlining the research issues in Section 2.5 extracted from the analysis presented in this chapter.

Chapter 3 (focal theory) concentrated on investigating the research issues that derived from Chapter 2. In doing so, Chapter 3 proposed a conceptual model for EAI adoption in LGAs. The proposed model contributes in the areas of LGAs and EAI. Initially, in Section 3.1 the researcher highlighted several previous studies on EAI adoption illustrating different factors. The researcher learnt that such factors are specific to one sector and are not applicable to other sectors thus, cannot influence EAI adoption in other sectors. As a result, additional factors were required in the context of LGAs. In addition to including additional factors any adapted model needs to be refined and tailored to match the context it is applied to. Therefore, based on the review of EAI adoption studies, this research used the factor-oriented approach for investigating EAI adoption in LGAs. In doing so, the researcher used Themistocleous (2004) model as the basis for this research. Thereafter, the researcher investigated and explained common factors supporting EAI adoption in private and public domain and other factors influencing EAI adoption in LGAs. Based on the factors presented in Chapter 3, the researcher proposed the factors influencing EAI adoption in LGAs. These factors make a novel contribution at the conceptual level.

The researcher reported that none of the previous studies on EAI adoption attempted to investigate on how the factors influence EAI adoption on different phases of the adoption lifecycle (Chapter 2). Moreover, there is no literature evidence that reports prioritising the importance of EAI adoption factors on different phases of the adoption lifecycle. Thus, this indicates a gap in the normative literature. On further investigating the literature gap and enhancing the current research area, the researcher presented the adoption lifecycle phases in Section 3.2. In doing so, mapping all the factors identified in Sections 3.1.1 and 3.1.2 on different phases of the adoption lifecycle. The notion was to assist the LGA decision-makers to identify which factor(s) may influence them while adopting EAI on different phases of adoption lifecycle. The actual mapping of factors was carried out through empirical research in Chapter 5. To validate the importance of EAI adoption factors, an attempt was made for focusing on the theory development on investigating the prioritisation of factors for EAI adoption in the local government authorities in Section 3.3. In piecing together the factors, adoption phases, mapping and prioritisation of factors theory, the researcher proposed a conceptual model for EAI adoption in LGAs. Finally, Chapter 3 outlined the research issues in Table 3.3.

Chapter 4 outlined the research approach, methodology and design to carry out the research (Data Theory) reported in this thesis. The research methodology (graphically represented in Figure 4.1) was developed and adopted, with justification of the selection of qualitative research approaches to collect the data from the local government authorities within the UK. The necessary data were extrapolated through interviews and multiple of inquiry, in order to test and validate the conceptual model proposed in Chapter 3. The research methodology described in Chapter 4, was used in Chapter 5 to test the conceptual model (Figure 3.7). Chapter 5 (Data theory) reports the empirical evidence derived from four case-study projects within three local government authorities, namely LGA_A [CICTD, CSD], LGA_B and LGA_C. The chapter begins by discussing on the establishment of the local government authorities in the UK. The research methodology described in Chapter 4, was used in Chapter 5 to test the conceptual model (Figure 3.7). In Chapter 5, the preliminary research findings, the data retrieved to explore the conceptual model and the issues under investigation (Table

3.3) were described. The application of AHP technique (as proposed in Chapter 4) demonstrated the importance of factors influencing EAI adoption on different phases of the adoption lifecycle, in the case organisations. This enhanced the quality of the evaluation process, and illustrated that the importance of factors in their specific factor categories. Moreover, this provided insights into the direction of better understanding of the importance of factors influencing EAI adoption.

Accordingly, Chapter 6 used the empirical data derived from the case organisations to: (a) provide the lessons learnt from this research (Section 6.2), (b) revising the proposed factors for EAI adoption in LGAs (presented in Figure 3.2) for EAI adoption in LGAs (Section 6.3.1), (c) revising the proposed adoption lifecycle phases (presented in Figure 3.3) in Section 6.3.2 and finally revising the conceptual EAI adoption model (presented in Figure 3.7) in Section 6.3.3. The empirical findings confirmed the validity of the factors influencing EAI adoption, adoption lifecycle phases, mapping of factors on the adoption lifecycle phases and prioritising the importance of EAI adoption factors (in their specific factor categories) on the adoption lifecycle phases. Based on the empirical findings and lessons learnt, Chapter 6 revised the model for EAI adoption in LGAs as presented in Figure 6.3. The local government authorities can use this model as a decision-making tool during the EAI adoption process. It is not claimed that the proposed model is appropriate for all decision-making situations; however, it can establish itself as being a novel and beneficial approach to study EAI adoption in local government authorities.

7.2 Meeting the Aim and Objectives of this Thesis

To achieve the aim of this thesis, a number of objectives were defined in Chapter 1 that are accomplished as discussed in the previous chapters. These objectives are summarised in Table 7.1 and analysed in the following paragraphs.

Objectives	Section/Chapter
Objective 1	Chapter 1 and Chapter 2
Objective 2	Chapter 2 (Section 2.4, Table 2.2) and Chapter 3
Objective 3	Chapter 3 and Chapter 4
Objective 4	Chapter 3 and Chapter 4
Objective 5	Chapter 5, Chapter 6 and Chapter 7

Table 7.1: Meeting the Aim and Objectives of this Thesis

- ***Objective 1:*** To critically review EAI literature to understand the area with particular focus on the local government authorities.

Based on the literature review, several research gaps were identified and were further examined and investigated by the researcher (Chapter 1 and Chapter 2).

- ***Objective 2:*** To identify and evaluate factors influencing EAI adoption in the local government authorities.

  Based on the critical analysis of the literature on different EAI adoption models, the researcher identified several EAI adoption factors (Table 2.2) reported in private and public domain. It was identified that there is absence of theoretical models that deal with EAI adoption in the local government authorities. In doing so, the researcher identified other factors that influence EAI adoption in LGAs (Chapter 2 and Chapter 3).

- ***Objective 3:*** To investigate the importance of the influential factors that can support the overall decision-making process for EAI adoption in the local government authorities.

  Based on the research issues identified in Chapters 2 and 3, the researcher proposed the adoption lifecycle phases and to prioritise the importance of EAI adoption factors on different phases of the adoption lifecycle, the researcher proposed a theory for prioritising the importance of EAI adoption factors (Chapter 3). It is not claimed that AHP is the best technique but it assists in identifying the importance of factors different phases of the adoption lifecycle (Chapter 4).

- ***Objective 4:*** To develop and propose a model for EAI adoption in the local government authorities.

  Based on all the research conducted in the previous chapters, the researcher proposed a conceptual model for EAI adoption in the local government authorities. In order to test the proposed conceptual model an appropriate research methodology was justified and explained in Chapter 4.

- ***Objective 5:*** To test and evaluate the framework, within practical arena and provide a novel contribution to the domain of local government authorities and enterprise application integration.

  Based on justifying the research methodology and using it to test the proposed conceptual model, Chapter 5 analysed and presented the empirical data collected from three case organisations in the UK. In doing this, testing and evaluating the conceptual model proposed in Chapter 3. In Chapter 6, the research findings derived from the case studies were considered and used to modify the conceptual model accordingly. The *revised model may support the decision-makers while adopting EAI in LGAs. Moreover, Chapter 7 begins by summarising the thesis and drawing conclusions that derived from both the literature and empirical research reported in this thesis. Thereafter, stating the novel contribution.*

The accomplishment of the aforesaid objectives was made possible through the development of a novel model for the examination of issues related to EAI adoption in LGAs. This was demonstrated by examining the limitations of the established norms in EAI adoption and addressing open issues in the practice of EAI adoption in LGAs. Thus, this research has contributed to both theory and practice. The individual elements of the contribution made by this work stem from different components in this thesis: (a) from the contextual information provided in Chapters 1, 2 and 3, (b) to the research methodology reported in Chapter 4, (c) through the design and the conduct of the case studies reported in Chapters 5, and finally, (d) the empirical analysis of the cases and the development of the revised model presented in Chapters 5 and 6.

7.3 Main Findings of this Thesis

The overall main findings derived from the work presented in this thesis are presented below:

- ***Finding 1:*** The literature is limited regarding EAI adoption in LGAs. This has been confirmed while conducting empirical research in different UK local government authorities.

- ***Finding 2:*** The critical analysis of the normative literature led the researcher in identifying several IT infrastructure limitations in the local government authorities. Much of the limitations identified from the literature are empirically confirmed and reflected in Chapter 5.

- ***Finding 3:*** The researcher learnt that several studies investigate various factors that influence IT and integration technologies adoption. Factors from these studies may be specific to one sector and may not be applicable to other sectors and accordingly, may not influence IT and integration technology adoption in other sectors. As a result, additional factors are required for a particular context. Based on the literature analysis and findings, the researcher proposed factors influencing EAI adoption in the local government authorities. The researcher suggests that these factors can be used by LGAs to build an understanding before adopting EAI. Most of the factors are validated with the identification of six new factors from the case organisations as demonstrated in Chapters 5 and 6.

- ***Finding 4:*** The researcher recognised a literature gap that none of the previous studies on EAI adoption investigated on mapping of factors on adoption lifecycle phases and prioritising the importance of EAI adoption factors on adoption lifecycle phases. The researcher fulfilled this literature gap by proposing adoption lifecycle phases and using AHP technique and Expert Choice software to prioritise the importance of EAI adoption factors on adoption lifecycle phases. All the adoption lifecycle phases are validated with case organisations identifying new adoption lifecycle phases as exhibited in Chapters 5 and 6.

- ***Finding 5:*** AHP technique (through Expert Choice software) assisted in identifying the importance of factors influencing EAI adoption (in their specific factor category) on different phases of the adoption lifecycle has also been validated in Chapter 5.

- ***Finding 6:*** In piecing together the EAI adoption factors, adoption lifecycle phases, mapping of factors and prioritisation of factors on the adoption lifecycle phases, the researcher proposed a conceptual model for EAI adoption in LGAs in Chapter 3. The proposed EAI adoption model is validated through the empirical research conducted in Chapter 5 and revising the EAI adoption model in LGAs in Chapter 6. The researcher asserts that the model can be used as a tool for decision-making to support organisations, and to allow researchers to comprehend and analyse the EAI adoption process in the local government authorities.

7.4 Statement of Contributions and Research Novelty

The individual elements of the contributions made by this work stem from different components in this thesis. From the contextual information provided in Chapters 1, 2 and 3, to the research methodology reported in Chapter 4, through the design and the conduct of the case studies reported in Chapters 4 and 5 and finally the empirical analysis of the cases and the development of an enterprise application integration adoption model in the local government authorities presented in Chapters 5 and 6. The work presented in this thesis has made novel contribution to the area of EAI adoption in the local government authorities and has extended the boundaries of knowledge.

The researcher claims that this research has novel contributions in five areas:

- ***Contribution 1:*** Novelty in investigating (Figure 3.2), validating (Tables 5.3, 5.18, 5.35 and 5.52) and identifying additional factors (e.g. data consistency, project delivery timescale, stakeholder's pressure, competition, stakeholder's support and central government grant as summarised in Figure 6.1) for enterprise application integration adoption in the local government authorities *[Fulfilling research issue 1 – Table 5.2]*.

- ***Contribution 2:*** Novelty in investigating (Figure 3.3), validating (Tables 5.4, 5.19, 5.36 and 5.53) and identifying new adoption lifecycle phases (external driver and/or driving force phase before the motivation phase and discussion and/or research phase before the proposal phase. In addition, adoption decision phase was also termed as investment phase as summarised in Figure 6.2) *[Fulfilling research issue 2 – Table 5.2]*.

- ***Contribution 3:*** Novelty in mapping enterprise application integration adoption factors on the adoption lifecycle phases (as highlighted in Tables 5.5, 5.20, 5.37 and 5.54) *[Fulfilling research issue 3 – Table 5.2]*.

- ***Contribution 4:*** Novelty in prioritising the importance of enterprise application integration adoption factors (in their specific factor categories) on the adoption lifecycle phases (as highlighted in Tables [5.14, 5.15, 5.16 and 5.17]; [5.29, 5.30, 5.31 and 5.32]; [5.46, 5.47, 5.48 and 5.49] and [5.63, 5.64, 5.65 and 5.66]) *[Fulfilling research issue 4 – Table 5.2]* and thus,

- ***Contribution 5:*** *Fulfilling aim of this thesis* i.e. overall, the aforesaid contributions lead to a novel model for enterprise application integration adoption in the local government authorities. This model provides the local government authorities, senior management and others a clear guideline while adopting EAI.

The contribution and research novelty of this thesis is summarised in Table 7.2.

		Research Novelty	Research Contribution
Novelty in Identifying and Validating Additional Factors for EAI adoption in the Local Government Authorities	Investigating and Validation of Other Factors Influencing EAI Adoption in LGAs.	–	✓
	Identification of New Factors through Empirical Research.	✓	✓
Novelty in Investigating, Validating and Identification of New of Adoption Lifecycle phases	Investigating Adoption Lifecycle Phases and Validating through Empirical Research in the Case Organisations.	–	✓
	Identification of New Adoption Lifecycle Phases through Empirical Research in the Case Organisations.	✓	✓
Novelty in Mapping EAI Adoption Factors on Adoption Lifecycle Phases	Mapping the Factors Influencing EAI Adoption on adoption lifecycle phases.	✓	✓
Novelty in Prioritising the Importance of EAI Adoption Factors on Adoption Lifecycle Phases	Using AHP Technique and Expert Choice Software to Prioritise the Importance of Factors (in their Specific Factor Categories) Influencing EAI Adoption on Adoption Lifecycle Phases.	✓	✓
Novel Model for EAI Adoption in the Local Government Authorities	Novel Combination of Factors Influencing EAI Adoption, Adoption Lifecycle Phases, Mapping of Factors on the Adoption Lifecycle Phases and Prioritising the Importance of EAI Adoption Factors on the Adoption Lifecycle Phases.	✓	✓

Table 7.2: Contributions and Research Novelty

7.5 Research Achievements

Hitherto, the researcher highlighted the individual elements of the contributions and research novelty made by this thesis. However, at the wider context this research aimed to enhance the technical decision making process while adopting enterprise application integration technologies in the local government authorities. This was achieved by proposing and validating a novel model (Figure 6.3) for enterprise application integration adoption in the practical arena (LGA_A CICTD, LGA_A CSD, LGA_B and LGA_C).

The key beneficiaries are the decision makers and practitioners within the local government authorities, and researchers within the academic community. All of these benefit from the research in this thesis as a guideline to analyse and understand EAI adoption in the local government authorities. In doing so, this research work significantly contributes to the body of knowledge and practice in the areas of enterprise application integration and the local government authorities by providing sufficient support to the decision makers in speeding up the EAI adoption process in LGAs.

7.6 Research Limitations

The combination of theoretical discussions, critical analysis of the literature and empirical research discussed in Chapters 1, 2, 3, 5 and 6 represents the start of research on EAI adoption in the local government authorities. However, the theoretical and empirical data collected are confined to the limited context of the local government authorities in the UK. The structure of LGAs varies in different parts of the UK. There are five different types of authorities in the UK and these are divided into single-tier and two-tier authorities as shown below.

- Single Tier Authorities
  - Metropolitan Authorities
  - London Boroughs
  - Unitary or Shire Authorities

- Two Tier Authorities
  - County Council
  - District Council

Moreover, the organisational structure, nature and size of each authority vary among themselves, from city to city and even country to country. Therefore it may be difficult to generalise the results of this research to other part of the UK and other countries. A limitation of the qualitative research method produced was difficult to generalise from the case studies. Walshman (1995) also used three case studies and noted the difficulty of generalisation from such a small sample. However, the limitation of such a situation was overcome upon reasoning that attempts to compensate for this problem are made by drawing on other literature and case materials (Walshman, 1995). Therefore, similar reasoning was used in this research.

The discussions in Chapter 4 focused on the use of qualitative method for collecting the data for this study. The reason for this is that the qualitative method facilitates generalisation of soft, rich contextual data, which is associated with human and organisational issues. However, despite the advantages the qualitative research provides, this method does have disadvantages as well, such as being time consuming, in that the researcher spent lot of time in the process of data collection and analysis. The amount of data collected from four projects in three case organisations was more contextual. This made the interpretation difficult and hard to achieve without some degree of bias. Qualitative research is also criticised for its inability to make a scientific link between theory and research. Nevertheless, as explained in Chapter 4, the bias of qualitative research that results from the interpretation elements allows a comparison of the data with other empirically accumulated data, and adds further flexibility in developing rationalisations. However, in the case of this research, this concern was also addressed through developing a model that represents the factors influencing EAI adoption, adoption lifecycle phases, mapping of EAI adoption factors on adoption lifecycle phases and prioritising the importance of EAI adoption factors (in their specific factor category) on adoption lifecycle phases.

The most important difficulty the researcher faced was not being able to interview more than three respondents from the case organisations. Due to this, the researcher failed to arrange appointments, since they had demanding schedules. One interviewee (from LGA_C) was reluctant to give access to information such as documents representing details analysis of the project, which was due to confidently reasons.

7.7 Recommendations for Future Research

Although the empirical research validated the proposed model, the research presented in his thesis is no exception; as a result this research can be further developed. In the light of the reflections and the limitations it is recommended that further work could usefully be pursed as follows:

- ***Recommendation 1:*** The model for EAI adoption in the local government authorities was based on three case organisations in the United Kingdom. Chapter 1 highlights and Chapter 5 validates that the organisational structure and nature of LGAs is different from the other LGAs. It can also be said that local government authorities in other cities within the UK and even other countries may as well be distinct in their operational activities. In addition, the type of community may as well be different. Therefore, the results of this research cannot be generalised for all. The researcher thus recommends validating this model in the context of different cities and countries.

- ***Recommendation 2:*** It was noted that there are multiple internal and external stakeholders that indirectly or directly influenced EAI adoption in the case organisations. Another recommendation for the future study may be the detailed identification and analysis of (a) additional internal and external stakeholder(s) that may influence EAI adoption on different adoption lifecycle phases and (b) the interrelationship of factors influencing EAI adoption with internal an/or external stakeholder(s) i.e. which stakeholder(s) is related and not related to a specific (or a number of factors) on different adoption lifecycle phases, as this may further enhance and support the decision makers in identifying different stakeholders and factors influencing EAI adoption in LGAs.

- ***Recommendation 3:*** This research has found the EAI adoption benefits, barriers, cost and risks realisation is an important issue. Thus, it is recommended to transform the EAI benefits, barriers cost and risks (including their sub-factors) into a large-scale survey questionnaire, instead of using interpretive epistemology. Evidently, this was not feasible in the past, due to the shortage of time. A large-scale survey will give the opportunity to determine the identification and validation of the EAI adoption benefits, barriers cost and risks in the context of the local government authorities, and will contribute in better decision making regarding EAI adoption.

- ***Recommendation 4:*** Another important recommendation is to: (a) validate the revised adoption lifecycle phases, (b) conduct the AHP-based evaluation of the revised EAI adoption factors and (c) finally, validate the revised EAI adoption model in the local government authorities. The reason for this is that due to the shortage of time the researcher was unable to do so. This will provide a broader view of the EAI adoption factors, the adoption lifecycle phases and will provide support to decision makers in understanding EAI benefits.

- ***Recommendation 5:*** Lastly, an important recommendation is to explore other emerging integration concepts from the enterprise application integration set of technologies for example, Service Oriented Architectures (SOA) and Enterprise Service Bus (ESB) and apply and identify their implications within the context of the local government authorities.

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A

Appendix A: Acronyms

A	
AD	Adoption Decision
AHP	Analytical Hierarchy Process
AMASE	A multi-agency working research project
API	Application Programming Interface
B	
B	Barriers
B*	Benefits
BiW	Business Intelligence Warehouse
BPR	Business Process Reengineering
C	
C*	Centralisation
CSCD	Children's Social Care Department
CSPM	Children Services Portfolio Manager
CS	Citizen Satisfaction
CSD	Citizen Service Department
CSV	Comma Separate Value
C✦	Conception
CR	Consistency Ratios
C	Cost
CICTD	Corporate Information and Communication Technology Department
CITI	Corporate Information Technology Infrastructure
CM	Critical Mass
CRM	Customer Relationship Management
D	
DEAT	Data Envelopment Analysis Technique
DKMS	Data and Knowledge Management Systems
DSP	Data Security and Privacy
DW	Data Warehousing
DIS	Document Imaging System
DSM	Development Service Manager
DALI	Delivery and Access to Local Government and Services
E	
EDI	Electronic Document Interchange
EDMS	Electronic Document Management Systems
EDRM	Electronic Document and Records Management
e-Forms	electronic Forms
ESCR	Electronic Social Care Record
ESD	Electronic Service Delivery

e-Government	electronic Government
EAI	Enterprise Application Integration
EAI-DPP	EAI Demonstration Pilot Project
ERP	Enterprise Resource Planning
EF	Evaluating Frameworks
EC	Expert Choice
EDI	Electronic Document Interchange
EIS	Executive Information Systems
F	
FC	Financial Capability
FF	Financial Factors
FFTP	File Transfer Protocol
F	Formalisation
FCM	Fuzzy Cognitive Mapping
G	
GIS	Geographic Information Systems
GUI	Graphical User Interface
H	
HCSCD	Head of Children's Social Care Department
HICT	Head of Information and Communication Technology
HIT	Head of Information Technology
HO	Healthcare Organisations
HAA	Higher Administrative Authority
HCM	Human Capital Management
HR	Human Resource
I	
IEM	Implementing Electronic Government
ICS	Integrated Children's System
ICT	Information and Communication Technologies
IT	Information Technology
ITC	Information Technology Capabilities
ITI	Information Technology Infrastructure
ITS*	Information Technology Sophistication
ITS	Information Technology Support
IS	Information Systems
ISC	Integration Solution Consultant
J, K	
-	-
L	
LGAs	Local Government Authorities
LLPG	Local Land Property Gazetteer
LASER	Local Authorities Secure Electoral Register
M	
M	Mapping
MC	Managerial Capability
MSS	Managers Self Service
MK	Market Knowledge
MO	Multinational Organisations
MVM	MVM is a business processing system designed to support planning department.

N	
NHS	National Health Service
NNDR	National Non- Domestic Rate
O	
ODPM	Office of the Deputy Prime Minister
OFDF	OfficeForms Data Format
OF	Organisational Factors
ODBC/JDBC	Open Database Connectivity/ Java Database Connectivity
P	
PC	Personal Computers
PITK	Personnel IT Knowledge
PF	Pressure Factors
P	Proposal
PC	Project Champion
PM	Project Manager
PSD	Principle Systems Developer
Q	
-	-
R	
RA	Ranking Approach
ROI	Return On Investment
S	
SDSE	Senior Development Support Engineer
SSD	Senior Systems Developer
SR	Service Request
SDMA	Service Delivery Manager for Applications
S	Size
SMAR	Simple Multi-Attribute Rating
SME	Small Medium Enterprises
SCM	Supply Chain Management
SF	Support Factors
T	
TF	Technological Factors
TMS	Top Management Support
TR	Technological Risks
U	
UK	United Kingdom
V	
VPN	Virtual Private Network
W	
WM	Web Manager
WWW	World Wide Web
X	
XML	eXtensible Mark-up Language
Y	
Y2K	Year 2000
Z	
-	-

B

Appendix B: Interview Agenda

The interview questionnaire is divided into 5 sections. The questionnaire aims to address the following sections:

SECTIONS
Section A: General Local Government Authority Information (Organisational Background).
Section B: General Interviewee Information.
Section C: Enterprise Application Integration Adoption in Local Government Authority Information.
Section D: Enterprise Application Integration Adoption Lifecycle Phases.
Section E: Mapping and Prioritising the Importance of Enterprise Application Integration Adoption Factors on Adoption Lifecycle Phases Information.

Section A – General Local Government Authority Information (Organisational Background)

A.1 The structure of LGA varies in different parts of the UK. However, there are five different types of authorities in England; these are divided into single-tier and two-tier authorities as shown below. According to this structure, what is your status in the overall local government hierarchy?

- Single Tier Authorities
  - Metropolitan Authorities ☐
  - London Boroughs ☐
  - Unitary or Shire Authorities ☐
- Two Tier Authorities
  - County Council ☐
  - District Council ☐
- Other ☐ Please specify ______________

A.2 What is the population in your community? (Approximately) ☐

A.3 How many employees work in this LGA? (Approximately)

☐ < 5
☐ 5 – 10
☐ 11 – 50
☐ 51 – 500
☐ 501 – 1000
☐ 1000 – 5000
☐ 5000 or more

A.3 How many citizen queries does your local authority receive on daily basis? (Approximately) ☐

A.4 How many citizens (face-to-face) contacts does your local authority receive on daily basis? (Approximately) ☐

A.5 Please draw the organisational chart (e.g. departments) of your local authority.

A.6 How was your organisational IT infrastructure organised *before* adopting EAI? Please could you draw the IT infrastructure in your LGA?

A.7 The efforts to modernise the LGA services have resulted in the development of incompatible and heterogeneous systems. Have you ever come across the need to integrate incompatible and heterogeneous systems? If yes, what were the challenges that made you integrate the systems?

A.8 If you have come across the need for integration of your systems, can you please describe what was the process towards integration?

____

____

____

____

____

A.9 If you have come across the need for integration of your systems, can you please describe integration project?

____

____

____

____

____

A.10 What do you think about the following limitations in IT Infrastructure?

- **ERP Systems Failures:**

____

____

____

____

____

- **Organisational Information Sharing and IS Integration:**

____

____

____

____

____

- **Citizen Data Security and Privacy Issues:**

- **Business Process Reengineering (BPR) in e-Government Projects:**

- **Front-Office/Back-Office Operations and Functioning:**

- **Financial Issues in Implementing Integrated e-Government:**

- **Supporting Management and Decision Making Process:**

Section B – General Interviewee Information

B.1 Interviewee's Name and Contact Details.

Forename(s): **Surname:**

....

Telephone Number:

....

Fax Number:

....

E-mail address:

....

B.2 Interviewee's Age

- ☐ 18 – 25
- ☐ 26 – 35
- ☐ 36 – 45
- ☐ 46 – 55
- ☐ 56 – 65
- ☐ 66 – 75
- ☐ 76 or more

B.3 Interviewee's Gender

- ☐ Female
- ☐ Male

B.4 Interviewee's Position/Role

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Section C – Enterprise Application Integration Adoption in Local Government Authority Information

C.1 Who initiated the idea of EAI Adoption in your local authority?

C.2 What was the need to integrate your IT infrastructure?

C.3 What were the main motivations for EAI Adoption in your local authority?

C.4 It has been reported in the normative literature that the local government authorities, have been laggards in adopting technological solutions e.g. EAI. While adopting EAI, did you face any kind of problem(s)?

☐ Yes ☐ No

C.5 If yes, then which factors do u think negatively affected the EAI adoption process?

C.6 If no, then which factors do you think positively affected the EAI adoption process?

C.7 PRESSURE FACTORS:

In your perspective, possessing 'market knowledge' has influenced your decision for EAI adoption in your local authority? Please explain:

C.7.1 In your perspective, has 'critical mass' as a factor influenced your decision to adopt EAI? Please explain:

C.7.2 In your perspective, has citizen's satisfaction as a factor influenced your decision to adopt EAI? Please explain

C.7.3 What other external pressure factors you have faced while taking the decision for EAI adoption in your local authority? Please explain:

C.7.4 In your perspective, has the project champion as internal personnel in your LGA influenced your decision to adopt EAI? Please explain:

C.7.5 What other internal pressure factors you have faced while taking the decision for EAI adoption in your local authority? Please explain:

C.8 FINANCIAL FACTORS:

C.8.1 In your perspective, has 'financial capability' of your authority proved to influence your decision for EAI adoption? Please explain:

C.8.2 What other financial factors you think influenced your decision for EAI adoption in your local authority? Please explain:

C.9 ORGANISATIONAL FACTORS:

C.9.1 In your perspective, has 'managerial capability' proved to influence your decision for EAI adoption? Please explain:

C.9.2 Larger LGAs may adopt more sophisticated and advanced information technologies as compared to smaller LGAs because larger LGAs *(a)* have greater financial resources *(b)* are in more need of these technologies *(c)* have superior institutional ability such as IT departments to support these technologies. Do you agree with this statement?

- ☐ Yes
- ☐ No

C.9.3 If yes then has organisational and community population size influenced your decision for EAI adoption? Please explain:

C.9.4 If no, then please explain what do you think about organisational and community size?

C.9.5 In your perspective, has 'centralisation' proved to influence your decision for EAI adoption? Please explain:

C.9.6 In your perspective, has 'formalisation' influenced your decision for EAI adoption? Please explain:

C.9.7 What benefits do you think were provided after EAI adoption? Literature indicates that EAI provides a number of benefits to the organisations as illustrated in the following table. Please highlight the benefits EAI provided you after adopting.

Benefits	Less Important	Moderate	More Important
Increase in collaboration among partners			
Prove for other departments and organisations to get involved			
Support efficient data sharing			
Provide reliable data transfer			
Provide improved citizen data privacy / security			
Achieves return on investment			
Provides more understanding and control of processes			
Improves management and supports decision making			
Results in more organised business processes			
Allow organisations to do business more effectively			
Increases organisational performance			
Achieves citizen satisfaction			
Results in reusable systems, components and data			
Reduces redundancy of applications, data and tasks			
Reduces cost			
Faster and cheaper implementation than bespoke solutions			
Increases flexibility			
Quicker response to change			
Offers interfaces-standardisation			
Provides flexible, maintainable and manageable solutions			
Results in reliable data			
Process and systems scalability			
Provides portability			
Reduces development risks			
Achieves non-invasive solutions			
Achieves process integration			
Increases data analysis			
Improves data quality			
Offers reduced development risks			
Improves systems adaptability to business changes			
Provides real-time integration			
Helps in improving customer relationships			
Provides improved value added services			

C.9.8 What other benefits do you think were provided after EAI adoption?

Benefits	Less Important	Moderate	More Important
Other:			
Other:			
Other:			
Other:			

C.9.9 What barriers do you think you faced while adopting EAI? Literature indicates that due to EAI adoption organisations faced several barriers as illustrated in the following table. Please highlight which barriers your LGA faced?

Barriers	Less Important	Moderate	More Important
EAI requires higher levels of investment			
Resistance to change			
Politics and political impact (e.g. who controls the processes)			
No single EAI product solves all integration problems			
No time for training employees on integration technologies			
Extra cost for redesign and change business structure, processes			
Lack of employees with EAI skills			
Cultural issues			
High complexity in understanding the processes and systems in order to redesign and integrate them			
Earlier approaches on EAI had proved problematic			
Complexity of business processes			
Proliferation and confusion among the integration technologies			
Reluctant to share data			

C.9.10 What other barriers do you think you faced while adopting EAI?

Barriers	Less Important	Moderate	More Important
Other:			
Other:			
Other:			
Other:			

C.10 SUPPORT FACTORS:

C.10.1 In your perspective, how have the following support factors influenced your decision for EAI adoption in your LGA? Please explain:

- **Higher Administrative Authority Support:**

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- **Top Management Support:**

- **IT Support:**

- **Other(s):**

C.11 TECHNOLOGICAL FACTORS:

C.11.1 Is technology evaluation a priority in your LGA?

☐ Yes
☐ No

C.11.2 If yes, then what evaluation method(s) you used to evaluate EAI tools? Please explain:

C.11.3 If no, then please explain what conventional methods you have used in the past?

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C.11.4 Do you think you faced any EAI technological risks? Please explain: If yes, then please mention the risks in the following table and value them according to the scale given.

EAI Risks	Less Important	Moderate	More Important

C.11.5 Do you think organisational IT capability is a major factor for influencing EAI adoption? Please explain:

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C.11.6 However, does data security and privacy as a factor influence your organisation to adopt EAI? Please explain:

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C.12 How is your organisational IT infrastructure organised *after* adopting EAI? Please could you draw the IT infrastructure in your LGA?

C.12 The normative literature indicates that the EAI adoption in the local government authorities may be affected by multiple factors and sub factors. These factors are presented in the following table. Which of these factors do you think affect the EAI adoption process, while adopting EAI technology and how by using the ranking as: low (○), medium (◉), high (●) scale and symbol (×) to show that there is no applicability.

	Factors Influencing EAI Adoption	Motivation	Conception	Proposal	Adoption Decision
PF	Project Champion				
	Citizen's Satisfaction				
	Critical Mass				
	Market knowledge				
TF	Evaluation Frameworks				
	Technological Risks				
	IT Infrastructure				
	Personnel IT Knowledge				
	IT Sophistication				
	Data Security and Privacy				
SF	Top Management Support				
	IT Support				
	Higher Administrative Authority				
FF	Return on Investment				
	Cost				
OF	Centralisation				
	Managerial Capability				
	Barriers				
	Benefits				
	Formalisation				
	Size				

C.13 Can you think of any other factors that affected you during EAI adoption process?

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Section D – Enterprise Application Integration Adoption Lifecycle Phases Information

D.1 It has been reported in the normative literature that there are several adoption lifecycle phases while adopting technologies. These phases are presented in the following table.

Adoption Lifecycle Phases	Tick	Comment
Motivation		
Conception		
Proposal		
Adoption Decision		

D.2 Can you think of any other phases that you come across before taking the adoption decision while adopting EAI technological solutions?

Section E – Mapping and Prioritising the Importance of Enterprise Application Integration Adoption Factors on Adoption Lifecycle Phases Information

E.1 Horizontally, the following table illustrates the adoption lifecycle phases and vertically the factors influencing the EAI adoption. In the following table please could you map which factor(s) you believe affected the EAI adoption process in which phase(s) in your LGA?

	Factors Influencing EAI Adoption	Motivation	Conception	Proposal	Adoption Decision
PF	Project Champion				
	Citizen's Satisfaction				
	Critical Mass				
	Market knowledge				
TF	Evaluation Frameworks				
	Technological Risks				
	IT Infrastructure				
	Personnel IT Knowledge				
	IT Sophistication				
	Data Security and Privacy				
SF	Top Management Support				
	IT Support				
	Higher Administrative Authority				
FF	Return on Investment				
	Cost				
OF	Centralisation				
	Managerial Capability				
	Barriers				
	Benefits				
	Formalisation				
	Size				

After mapping EAI adoption factors, please could you rank them using the following scale of ranking in the following table

Pairwise Comparison scale for AHP Preferences	
Numerical Rating	**Verbal Judgements of Preferences**
1	A is equally preferred over B
2	A is equally to moderately preferred over B
3	A is moderately preferred over B
4	A is moderately to strongly preferred over B
5	A is strongly preferred over B
6	A is strongly to very strongly preferred over B
7	A is very strongly preferred over B
8	A is strongly to very extremely preferred over B
9	A is extremely preferred over B

Pressure Factors	Project Champion	Citizen's Satisfaction	Critical Mass	Market Knowledge
Project Champion	1			
Citizen's Satisfaction		1		
Critical Mass			1	
Market Knowledge				1

Technological Factors	Evaluation Framework	Technological Risks	IT Infrastructure	Personnel IT Knowledge	IT Sophistication	Data Security & Privacy
Evaluation Framework	1					
Technological Risks		1				
IT Infrastructure			1			
Personnel IT Knowledge				1		
IT Sophistication					1	
Data Security & Privacy						1

Support Factors	Top Management Support	IT Support	Higher Administrative Authority
Top Management Support	1		
IT Support		1	
Higher Administrative Authority			1

Financial Factors	Return on Investment	Cost
Return on Investment	1	
Cost		1

Organisational Factors	Centralisation	Managerial Capability	Barriers	Benefits	Formalisation	Size
Centralisation	1					
Managerial Capability		1				
Barriers			1			
Benefits				1		
Formalisation					1	
Size						1

	Factors Influencing EAI Adoption	Motivation	Conception	Proposal	Adoption Decision
PF	Project Champion				
	Citizen's Satisfaction				
	Critical Mass				
	Market knowledge				
TF	Evaluation Frameworks				
	Technological Risks				
	IT Infrastructure				
	Personnel IT Knowledge				
	IT Sophistication				
	Data Security and Privacy				
SF	Top Management Support				
	IT Support				
	Higher Administrative Authority				
FF	Return on Investment				
	Cost				
OF	Centralisation				
	Managerial Capability				
	Barriers				
	Benefits				
	Formalisation				
	Size				

Appendix C: EAI Barriers, Benefits and Risks in the Case Organisations

Appendix C illustrates the EAI barriers, benefits and risks identified from the case organisations and related to Sections 5.2.2, 5.2.3, 5.3.2 and 5.4.2. Barriers, benefits and EAI technological risks illustrated in Tables C.1, C.2 and C.3 respectively were identified from the case study conducted in LGA_A CICTD from the EAI demonstration pilot project.

Category	Barriers	HICT	SDSE	SDMA
Operational	Extra cost on redesigning and change of business processes and structure	⦿	⦿	⦿
	Reluctant to share data	●	●	○
	Silo-mentality	●	●	●
Managerial	High complexity in understanding the processes and systems in order to redesign and integrate them	●	⦿	●
	Complexity of business processes	●	●	●
	Earlier approaches on EAI had proved problematic	⦿	●	●
Strategic	Funding from the central government	●	●	●
	Legislation	●	⦿	⦿
	Political impact & Issues (who controls the processes)	●	●	●
Technical	EAI requires higher levels of investment	●	●	●
	High investment to train staff to build skills on integration	●	●	●
	Lack of employees with EAI skills	●	●	⦿
	Weak support from vendor on EAI products	●	●	⦿
	Reliance on software vendors for expertise	●	●	●
	No evaluation frameworks used to assess EAI tools	●	●	●
	Lack of understanding of business process integration	●	●	●
	Lack of business process reengineering	●	●	●
Organisational	Resistance to change	●	●	⦿
	Cultural issues	●	○	○
	Allocation of funding to service areas	●	⦿	●
	No time for training employees on integration technologies	⦿	●	○

Table C.1: EAI Barriers at LGA_A CICTD

Category	Benefits	HICT	SDSE	SDMA
Operational	Reduces cost	●	●	●
	Flexibility of workplace	●	×	×
	Quicker response to change	●	⊙	●
Managerial	Provides more understanding and control of processes	●	●	●
	Improves management and supports decision making	⊙	●	⊙
	Increases local authority's performance	●	●	●
	Improves data quality	●	●	●
	Results in more organised business processes	⊙	●	●
Strategic	Increase in collaboration among departments and other councils	●	⊙	○
	Achieves citizen satisfaction	●	●	○
	Achieves return on investment	●	●	●
	EAI acts as a proof for other departments and local authorities to get involved	⊙	●	⊙
	Improving citizen relationships	●	●	○
	Support efficient information sharing	●	●	●
	Joint service delivery with other LGAs	●	⊙	⊙
	EAI assists in becoming more citizen service oriented.	⊙	●	×
Technical	Provide reliable data transfer	●	●	●
	Improved citizen data privacy / security	●	⊙	○
	Results in reusable systems, components and data	⊙	○	●
	Reduces redundancy of applications, data and tasks	⊙	⊙	○
	Faster and cheaper implementation than bespoke solutions	○	●	●
	Increases flexibility	●	●	⊙
	Offers interfaces-standardisation	⊙	⊙	⊙
	Provides flexible, maintainable and manageable solutions	●	⊙	●
	Results in reliable data	●	●	●
	Achieves process integration	●	●	●
	Increases data analysis	⊙	○	○
	Improves systems adaptability to business changes	●	○	●
	Provides real-time integration	●	●	⊙
	Improved value added services	●	●	○
	Rationalises Technical Skills Requirements	×	×	●
Organisational	Allow organisations to do business more effectively	⊙	⊙	●
	EAI supports in reducing citizen's data entry errors	●	●	●
	Improved data reporting to central government	●	●	⊙

Table C.2: EAI Benefits at LGA_A CICTD

EAI Technological Risks	HICT	SDSE	SDMA
Selection of suppliers for EAI products	●	×	×
Silo mentality	●	●	●
Identifying EAI business benefits	⊙	×	×
Adoption after implementation	●	×	×
Changes to LGA are imposed	●	●	⊙
Escalation of cost during implementation	⊙	×	×
Delivery time scale	●	●	×
Suffering from project scope	⊙	●	×
Bad publicity if EAI project fails	⊙	×	×
EAI a new technology in LGA, so not stable	×	×	●
Weak vendor support	●	×	●
Political Changes	●	●	⊙

Table C.3: EAI Technological Risks at LGA_A CICTD

Barriers, benefits and EAI technological risks illustrated in Tables C.4, C.5 and C.6 respectively were identified from the case study conducted in LGA_A CSD from the top level e-Forms and CRM system integration project.

Category	Barriers	HIT	WM	PM
Operational	Extra cost on redesigning and change of business processes and structure	●	○	⦿
	Reluctant to share data	●	●	●
	Data protection	⦿	●	●
	Silo-mentality	●	●	●
Managerial	High complexity in understanding the processes and systems in order to redesign and integrate them	●	⦿	●
	Complexity of business processes	●	○	●
	Earlier approaches on EAI had proved problematic	⦿	⦿	●
Strategic	Funding from the central government	●	●	●
	Legislation	●	●	⦿
	Political impact (who controls the processes)	●	●	●
	Political issues		●	
Technical	EAI requires higher levels of investment	●	○	●
	High investment to train staff to build skills on integration	●	●	●
	Lack of employees with EAI skills	●	○	⦿
	Weak support from vendor on EAI products	●	⦿	⦿
	Reliance on software vendors for expertise	●	⦿	●
	No evaluation frameworks used to assess EAI tools	●	●	●
	Lack of understanding of business process integration	●	●	●
Organisational	Resistance to change	●	●	⦿
	Cultural issues	●	●	⦿
	Allocation of funding to service areas	●	⦿	●
	No time for training employees on integration technologies	●	○	●

Table C.4: EAI Barriers at LGA_A CSD

Category	Benefits	HIT	WM	PM
Operational	Reduces cost	●	⦿	●
	Quicker response to change	●	○	●
Managerial	Provides more understanding and control of processes	●	⦿	●
	Improves management and supports decision making	●	●	●
	Increases local authority's performance	●	⦿	●
	Improves data quality	●	⦿	●
	Results in more organised business processes	⦿	●	●
Strategic	Increase in collaboration among departments/councils	⦿	●	●
	Achieves citizen satisfaction	●	●	○
	Achieves return on investment	●	○	●
	EAI acts as a proof for departments/LGAs to get involved	⦿	●	⦿
	Improving citizen relationships	●	●	○
	Support efficient information sharing	●	●	●
	Joint service delivery with other LGAs	●	●	⦿
	EAI assists in becoming more citizen service oriented.	⦿	⦿	●
Technical	Provide reliable data transfer	●	⦿	●
	Improved citizen data privacy / security	●	⦿	●
	Results in reusable systems, components and data	⦿	●	●
	Reduces redundancy of applications, data and tasks	⦿	⦿	●
	Faster/cheaper implementation than bespoke solutions	⦿	●	●
	Increases flexibility	●	⦿	⦿
	Offers interfaces-standardisation	⦿	●	⦿
	Provides flexible, maintainable and manageable solutions	●	●	●
	Results in reliable data	●	⦿	●
	Achieves process integration	●	●	●
	Increases data analysis	⦿	●	⦿
	Improves systems adaptability to business changes	●	⦿	●
	Provides real-time integration	●	●	⦿
	Improved value added services	●	●	⦿
Organisational	Allow organisations to do business more effectively	⦿	●	●
	EAI supports in reducing citizen's data entry errors	●	●	●

Table C.5: EAI Benefits at LGA_A CSD

EAI Technological Risks	HIT	WM	PM
Selection of suppliers for EAI products	●	●	⦿
Silo mentality	●	●	●
Identifying EAI business benefits	●	●	●
Changes to LGA are imposed	●	●	⦿
Delivery time scale	●	⦿	●
EAI a new technology in LGA, so not stable	⦿	⦿	●
Resistance to change	●	●	●

Table C.6: EAI Technological Risks at LGA_A CSD

Barriers, benefits and EAI technological risks illustrated in Tables C.7 and C.8 respectively were identified from the case study conducted in LGA_B from the DIS and SAP integration project.

Category	Barriers	HIT	PM	SSD
Operational	Extra cost for redesign and change business structure, processes	○	⊙	●
	Reluctant to share data	●	●	⊙
Managerial	High complexity in understanding the processes and systems in order to redesign and integrate them	○	⊙	⊙
	Complexity of business processes	○	○	⊙
	Earlier approaches on EAI had proved problematic	○	×	●
Strategic	Political impact (e.g. who controls the processes)	●	⊙	●
	Political Issues	●	⊙	●
Technical	EAI requires higher levels of investment	○	●	●
	High level of investment to train staff to build their skills on integration	○	●	●
	Lack of employees with EAI skills	⊙	●	●
	Proliferation and confusion among the integration technologies	○	⊙	●
	No single EAI product solves all integration problems	○	⊙	●
Organisational	Resistance to change	●	●	●
	Cultural issues	●	●	●
	No time for training employees on integration technologies	●	●	●

Table C.7: EAI Barriers at LGA_B

Category	Benefits	HIT	PM	SSD
Operational	Reduces cost	●	●	●
	Quicker response to change	⊙	●	●
	Developing a better IT system that can record in a far more systematic way	●	●	●
Managerial	Provides more understanding and control of processes	⊙	⊙	●
	Improves management and supports decision making	●	●	●
	Increase in LGA_B performance	●	●	●
	Results in more organised business processes	⊙	●	●
	Improves data quality	●	●	●
Strategic	Increase in collaboration among departments/councils	⊙	●	●
	Achieves return on investment	●	●	⊙
	EAI as a proof for departments and LGAs to get involved	⊙	×	●
	Support efficient information sharing	●	●	●
Technical	Provide reliable data transfer	●	●	●
	Results in reusable systems, components and data	⊙	⊙	●
	Reduces redundancy of applications, data and tasks	⊙	●	●
	Faster/cheaper implementation than bespoke solutions	●	×	⊙
	Increases flexibility	●	●	●
	Offers interfaces-standardisation	⊙	●	●
	Provides flexible, maintainable and manageable solutions	●	●	●
	Results in reliable data	●	●	●
	Achieves process integration	●	●	⊙
	Increases data analysis	●	●	●
	Improves systems adaptability to business changes	●	●	●
	Provides real-time integration	●	⊙	●
	Improved value added services	●	●	●
Organisational	Allow organisations to do business more effectively	●	●	●
	Allows employees to work anytime and anywhere	●	●	●
	Complete change in the way our staffs operate	●	●	×
	Enables to manage IT infrastructure with less staff	●	●	●
	Enables to adapt to changes easily	●	○	●
	EAI assists in making information standards much easier	⊙	●	●

Table C.8: EAI Benefits at LGA_B

Barriers, benefits and EAI technological risks illustrated in Tables C.9, C.10 and C.11 respectively were identified from the case study conducted in LGA_C from the SoftVendor and CRM System integration project.

Category	Barriers	HICT	DSM	PSD
Operational	Extra cost for redesign and change business structure, processes	●	●	●
	Reluctant to share data	⦿	⦿	●
Managerial	High complexity in understanding the processes and systems in order to redesign and integrate them	⦿	●	●
	Complexity of business processes	●	●	●
	Earlier approaches on EAI had proved problematic	●	●	●
Strategic	Political impact (e.g. who controls the processes)	●	●	⦿
	Political Issues	●	●	⦿
Technical	EAI requires higher levels of investment	●	●	●
	High level of investment to train staff to build their skills on integration	⦿	⦿	⦿
	Lack of employees with EAI skills	⦿	●	○
	Proliferation and confusion among the integration technologies	⦿	●	●
	No single EAI product solves all integration problems	⦿	●	●
Organisational	Resistance to change	●	⦿	●
	Cultural issues	○	●	○
	No time for training employees on integration technologies	●	●	●

Table C.9: EAI Barriers at LGA_C

Category	Benefits	HICT	DSM	PSD
Operational	Reduces cost	●	⊙	●
	Quicker response to change	●	●	⊙
Managerial	Provides more understanding and control of processes	●	●	⊙
	Improves management and supports decision making	●	●	○
	Increases local authority's performance	●	●	⊙
	Results in more organised business processes	●	●	●
Strategic	Increase in collaboration among departments and other councils	●	⊙	⊙
	Achieves citizen satisfaction	●	●	●
	Achieves return on investment	●	●	●
	EAI as a proof for other departments and LGAs to get involved	⊙	⊙	●
	Improving citizen relationships	●	●	⊙
	Support efficient information sharing	⊙	●	●
Technical	Provide reliable data transfer	●	●	●
	Improved citizen data privacy / security	●	●	⊙
	Results in reusable systems, components and data	●	●	●
	Reduces redundancy of applications, data and tasks	●	●	●
	Faster and cheaper implementation than bespoke solutions	⊙	⊙	●
	Increases flexibility	●	●	●
	Offers interfaces-standardisation	⊙	●	○
	Provides flexible, maintainable and manageable solutions	●	●	●
	Results in reliable data	●	●	●
	Achieves process integration	●	●	●
	Increases data analysis	●	●	⊙
	Improves systems adaptability to business changes	●	●	●
	Provides real-time integration	●	●	●
	Improved value added services	●	●	●
Organisational	Allow organisations to do business more effectively	●	●	●

Table C.10: EAI Benefits at LGA_C

EAI Technological Risks	HICT	DSM	PSD
EAI not able to deliver benefits	●	●	●
EAI solutions may not work	⊙	●	⊙
Lack of EAI skills	⊙	⊙	●
EAI cost	●	●	●
Lack of buying	⊙	●	○
Lack of commitment with EAI project	●	●	⊙

Table C.11: EAI Technological Risks at LGA_C

D

Appendix D: Empirical Calculations

Appendix D illustrates the detailed calculations for Steps 2 and 3 related to Sections 5.2.2.2.4, 5.2.3.2.4, 5.3.2.2.4 and 5.4.2.2.4.

		PF		TF		SF		OF
	M	PC	CM	ITS	DSP	TMS	HAA	S
PF	PC	1	6	0	0	0	0	0
	CM	1/6	1	0	0	0	0	0
TF	ITS	0	0	1	8	0	0	0
	DSP	0	0	1/8	1	0	0	0
SF	TMS	0	0	0	0	1	8	0
	HAA	0	0	0	0	1/8	1	0
OF	S	0	0	0	0	0	0	1

Table D.1: Pairwise Numerical Ranking of Factors on Motivation Phase by HICT in LGA_A CICTD (Step 2)

		PF		TF		SF		OF	Local Weight
	M	PC	CM	ITS	DSP	TMS	HAA	S	
PF	PC	0.8571	0.8571	0.0000	0.0000	0.0000	0.0000	0.0000	0.8571
	CM	0.1429	0.1429	0.0000	0.0000	0.0000	0.0000	0.0000	0.1429
TF	ITS	0.0000	0.0000	0.8889	0.8889	0.0000	0.0000	0.0000	0.8889
	DSP	0.0000	0.0000	0.1111	0.1111	0.0000	0.0000	0.0000	0.1111
SF	TMS	0.0000	0.0000	0.0000	0.0000	0.8889	0.8889	0.0000	0.8889
	HAA	0.0000	0.0000	0.0000	0.0000	0.1111	0.1111	0.0000	0.1111
OF	S	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Table D.1a: Normalised Numerical Ranking of Factors (Local Weights) on Motivation Phase by HICT in LGA_A CICTD (Step 3)

		PF	TF				FF	OF
	C	CM	ITI	PITK	ITS	DSP	ITS*	S
PF	CM	1	0	0	0	0	0	0
TF	ITI	0	1	1/9	1/8	1/4	0	0
	PITK	0	9	1	9	9	0	0
	ITS	0	8	1/9	1	8	0	0
	DSP	0	4	1/9	1/8	1	0	0
FF	ITS*	0	0	0	0	0	1	0
OF	S	0	0	0	0	0	0	1

Table D.2: Pairwise Numerical Ranking of Factors on Conception Phase by HICT in LGA_A CICTD (Step 2)

		PF	TF				SF	OF	Local
	C	CM	ITI	PITK	ITS	DSP	ITS*	S	Weight
PF	CM	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
TF	ITI	0.0000	0.0454	0.0833	0.0122	0.0137	0.0000	0.0000	0.0386
	PITK	0.0000	0.4090	0.7500	0.8780	0.4931	0.0000	0.0000	0.6325
	ITS	0.0000	0.3636	0.0833	0.0976	0.4383	0.0000	0.0000	0.2457
	DSP	0.0000	0.1818	0.0833	0.0122	0.0548	0.0000	0.0000	0.0830
SF	ITS*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
OF	S	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Table D.2b: Normalised Numerical Ranking of Factors (Local Weights) on Conception Phase by HICT in LGA_A CICTD (Step 3)

		PF		TF					SF			FF		OF				
	P	PC	CS	TR	ITI	PITK	ITS	DSP	TMS	ITS*	HAA	ROI	C	C*	MC	B	F	S
PF	PC	1	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	CS	1/9	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TF	TR	0	0	1	6	1/7	6	6	0	0	0	0	0	0	0	0	0	0
	ITI	0	0	1/6	1	1/7	1/4	1/5	0	0	0	0	0	0	0	0	0	0
	PITK	0	0	7	7	1	7	7	0	0	0	0	0	0	0	0	0	0
	ITS	0	0	1/6	4	1/7	1	1/5	0	0	0	0	0	0	0	0	0	0
	DSP	0	0	1/6	5	1/7	5	1	0	0	0	0	0	0	0	0	0	0
SF	TMS	0	0	0	0	0	0	0	1	1/8	7	0	0	0	0	0	0	0
	ITS*	0	0	0	0	0	0	0	8	1	1/8	0	0	0	0	0	0	0
	HAA	0	0	0	0	0	0	0	1/7	8	1	0	0	0	0	0	0	0
FF	ROI	0	0	0	0	0	0	0	0	0	0	1	8	0	0	0	0	0
	C	0	0	0	0	0	0	0	0	0	0	1/8	1	0	0	0	0	0
OF	C*	0	0	0	0	0	0	0	0	0	0	0	0	1	1/8	1/5	1/6	1/7
	MC	0	0	0	0	0	0	0	0	0	0	0	0	8	1	8	8	8
	B	0	0	0	0	0	0	0	0	0	0	0	0	5	1/8	1	1/6	1/7
	F	0	0	0	0	0	0	0	0	0	0	0	0	6	1/8	6	1	1/7
	S	0	0	0	0	0	0	0	0	0	0	0	0	7	1/8	7	7	1

Table D.3: Pairwise Numerical Ranking of Factors on Proposal Phase by HICT in LGA_A CICTD (Step 2)

		PF		TF					SF			FF		OF					Local
	P	PC	CS	TR	ITI	PITK	ITS	DSP	TMS	ITS*	HAA	ROI	C	C*	MC	B	F	S	Weight
PF	PC	0.9000	0.9000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.9000
	CS	0.0999	0.0999	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0999
TF	TR	0.0000	0.0000	0.1176	0.2608	0.0909	0.3116	0.4167	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2395
	ITI	0.0000	0.0000	0.0196	0.0434	0.0909	0.0129	0.0138	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0361
	PITK	0.0000	0.0000	0.8235	0.3043	0.6364	0.3636	0.4861	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.5228
	ITS	0.0000	0.0000	0.0196	0.1739	0.0909	0.0519	0.0138	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0700
	DSP	0.0000	0.0000	0.0196	0.2179	0.0909	0.2597	0.0694	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1315
SF	TMS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1093	0.0137	0.8615	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.3281
	ITS*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.8750	0.1095	0.0153	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.3333
	HAA	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0156	0.8767	0.1230	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.3384
FF	ROI	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.8889	0.8889	0.0000	0.0000	0.0000	0.0000	0.0000	0.8889
	C	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1111	0.1111	0.0000	0.0000	0.0000	0.0000	0.0000	0.1111
OF	C*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0370	0.0833	0.0090	0.0102	0.0151	0.0309
	MC	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2963	0.6667	0.3604	0.4898	0.8485	0.5323
	B	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1852	0.0833	0.0450	0.0102	0.0151	0.0677
	F	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2222	0.0833	0.2703	0.0612	0.0151	0.1304
	S	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2592	0.0833	0.3153	0.4285	0.1060	0.2385

Table D.3b: Normalised Numerical Ranking of Factors (Local Weights) on Proposal Phase by HICT in LGA_A CICTD (Step 3)

		TF		SF			FF		OF				
	AD	TR	PITK	TMS	ITS*	HAA	ROI	C	C*	MC	B	B*	S
TF	TR	1	1/7	0	0	0	0	0	0	0	0	0	0
	PITK	7	1	0	0	0	0	0	0	0	0	0	0
SF	TMS	0	0	1	8	8	0	0	0	0	0	0	0
	ITS*	0	0	1/8	1	1/7	0	0	0	0	0	0	0
	HAA	0	0	1/8	7	1	0	0	0	0	0	0	0
FF	ROI	0	0	0	0	0	1	8	0	0	0	0	0
	C	0	0	0	0	0	1/8	1	0	0	0	0	0
OF	C*	0	0	0	0	0	0	0	1	1/9	1/7	1/8	1/5
	MC	0	0	0	0	0	0	0	9	1	9	9	9
	B	0	0	0	0	0	0	0	7	1/9	1	1/8	7
	B*	0	0	0	0	0	0	0	8	1/9	8	1	8
	S	0	0	0	0	0	0	0	5	1/9	1/7	1/8	1

Table D.4: Pairwise Numerical Ranking of Factors on Adoption Decision Phase by HICT in LGA_A CICTD (Step 2)

		TF		SF			FF		OF					Local
	AD	TR	PITK	TMS	ITS*	HAA	ROI	C	C*	MC	B	B*	S	Weight
TF	TR	0.1250	0.1250	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1250
	PITK	0.8750	0.8750	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.8750
SF	TMS	0.0000	0.0000	0.8000	0.5000	0.8750	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.7250
	ITS*	0.0000	0.0000	0.1000	0.0625	0.0156	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0594
	HAA	0.0000	0.0000	0.1000	0.4375	0.1093	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2156
FF	ROI	0.0000	0.0000	0.0000	0.0000	0.0000	0.8889	0.8889	0.0000	0.0000	0.0000	0.0000	0.0000	0.8889
	C	0.0000	0.0000	0.0000	0.0000	0.0000	0.1111	0.1111	0.0000	0.0000	0.0000	0.0000	0.0000	0.1111
OF	C*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0333	0.0769	0.0078	0.0120	0.0079	0.0276
	MC	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.3000	0.6923	0.4922	0.8675	0.3571	0.5418
	B	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2333	0.0769	0.0547	0.0120	0.2778	0.1309
	B*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2667	0.0769	0.4375	0.0964	0.3175	0.2390
	S	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1667	0.0769	0.0078	0.0120	0.0397	0.0606

Table D.4b: Normalised Numerical Ranking of Factors (Local Weights) on Adoption Decision Phase by HICT in LGA_A CICTD (Step 3)

		PF		TF		SF	FF	OF	
	M	CS	CM	ITS	DSP	HAA	ROI	B*	S
PF	CS	1	6	0	0	0	0	0	0
	CM	1/6	1	0	0	0	0	0	0
TF	ITS	0	0	1	9	0	0	0	0
	DSP	0	0	1/9	1	0	0	0	0
SF	HAA	0	0	0	0	1	0	0	0
FF	ROI	0	0	0	0	0	1	0	0
OF	B*	0	0	0	0	0	0	1	1
	S	0	0	0	0	0	0	1	1

Table D.5: Pairwise Numerical Ranking of Factors on Motivation Phase by SDSE in LGA_A CICTD (Step 2)

		PF		TF		SF	FF	OF		Local Weight
	M	CS	CM	ITS	DSP	HAA	ROI	B*	S	
PF	CS	0.8571	0.8571	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.8571
	CM	0.1428	0.1428	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1428
TF	ITS	0.0000	0.0000	0.9000	0.9000	0.0000	0.0000	0.0000	0.0000	0.9000
	DSP	0.0000	0.0000	0.1000	0.1000	0.0000	0.0000	0.0000	0.0000	0.1000
SF	TMS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
FF	HAA	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
OF	B*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.5000	0.5000	0.5000
	S	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.5000	0.5000	0.5000

Table D.5b: Normalised Numerical Ranking of Factors (Local Weights) on Motivation Phase by SDSE in LGA_A CICTD (Step 3)

		PF		TF					SF		FF	OF		
	C	CM	MK	TR	ITI	PITK	ITS	DSP	ITS*	HAA	ROI	C*	MC	S
PF	CM	1	1/6	0	0	0	0	0	0	0	0	0	0	0
	MK	6	1	0	0	0	0	0	0	0	0	0	0	0
TF	TR	0	0	1	7	7	1/9	8	0	0	0	0	0	0
	ITI	0	0	1/7	1	1/5	1/9	1/6	0	0	0	0	0	0
	PITK	0	0	1/7	5	1	1/9	1/6	0	0	0	0	0	0
	ITS	0	0	9	9	9	1	9	0	0	0	0	0	0
	DSP	0	0	1/8	6	6	1/9	1	0	0	0	0	0	0
SF	ITS*	0	0	0	0	0	0	0	1	8	0	0	0	0
	HAA	0	0	0	0	0	0	0	1/8	1	0	0	0	0
FF	ROI	0	0	0	0	0	0	0	0	0	1	0	0	0
OF	C*	0	0	0	0	0	0	0	0	0	0	1	1/9	1
	MC	0	0	0	0	0	0	0	0	0	0	9	1	9
	S	0	0	0	0	0	0	0	0	0	0	1	1/9	1

Table D.6: Pairwise Numerical Ranking of Factors on Conception Phase by SDSE in LGA_A CICTD (Step 2)

		PF		TF					SF		FF	OF			Local Weight
	C	CM	MK	TR	ITI	PITK	ITS	DSP	ITS*	HAA	ROI	C*	MC	S	
PF	CM	0.1428	0.1428	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1428
	MK	0.8571	0.8571	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.8571
TF	TR	0.0000	0.0000	0.0960	0.2500	0.3017	0.0769	0.4363	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2322
	ITI	0.0000	0.0000	0.0137	0.0357	0.0086	0.0769	0.0090	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0288
	PITK	0.0000	0.0000	0.0137	0.1785	0.0431	0.0769	0.0090	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0642
	ITS	0.0000	0.0000	0.8645	0.3214	0.3879	0.6923	0.4909	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.5514
	DSP	0.0000	0.0000	0.0120	0.2143	0.2586	0.0769	0.0545	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1233
SF	ITS*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.8889	0.8889	0.0000	0.0000	0.0000	0.0000	0.8889
	HAA	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1111	0.1111	0.0000	0.0000	0.0000	0.0000	0.1111
FF	ROI	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
OF	C*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0909	0.0909	0.0909	0.0909
	MC	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.8182	0.8182	0.8182	0.8182
	S	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0909	0.0909	0.0909	0.0909

Table D.6b: Normalised Numerical Ranking of Factors (Local Weights) on Conception Phase by SDSE in LGA_A CICTD (Step 3)

		F		TF					SF			FF		OF					
	P	PC	CS	TR	ITI	PITK	ITS	DSP	TMS	ITS*	HAA	ROI	C	C*	MC	B	B*	F	S
PF	PC	**1**	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	CS	1/8	**1**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TF	TR	0	0	**1**	1/8	7	1/9	7	0	0	0	0	0	0	0	0	0	0	0
	ITI	0	0	8	**1**	8	1/9	8	0	0	0	0	0	0	0	0	0	0	0
	PITK	0	0	1/7	1/8	**1**	1/9	1	0	0	0	0	0	0	0	0	0	0	0
	ITS	0	0	9	9	9	**1**	9	0	0	0	0	0	0	0	0	0	0	0
	DSP	0	0	1/7	1/8	1	1/9	**1**	0	0	0	0	0	0	0	0	0	0	0
SF	TMS	0	0	0	0	0	0	0	**1**	9	9	0	0	0	0	0	0	0	0
	ITS*	0	0	0	0	0	0	0	1/9	**1**	8	0	0	0	0	0	0	0	0
	HAA	0	0	0	0	0	0	0	1/9	1/8	**1**	0	0	0	0	0	0	0	0
FF	ROI	0	0	0	0	0	0	0	0	0	0	**1**	1/9	0	0	0	0	0	0
	C	0	0	0	0	0	0	0	0	0	0	9	**1**	0	0	0	0	0	0
OF	C*	0	0	0	0	0	0	0	0	0	0	0	0	**1**	1/9	1/8	1/8	6	1
	MC	0	0	0	0	0	0	0	0	0	0	0	0	9	**1**	9	9	9	9
	B	0	0	0	0	0	0	0	0	0	0	0	0	8	1/9	**1**	1	8	8
	B*	0	0	0	0	0	0	0	0	0	0	0	0	8	1/9	1	**1**	8	8
	F	0	0	0	0	0	0	0	0	0	0	0	0	1/6	1/9	1/8	1/8	**1**	1/6
	S	0	0	0	0	0	0	0	0	0	0	0	0	1	1/9	1/8	1/8	6	**1**

Table D.7: Pairwise Numerical Ranking of Factors on Proposal Phase by SDSE in LGA_A CICTD (Step 2)

		PF		TF					SF			FF		OF						
	P	PC	CS	TR	ITI	PITK	ITS	DSP	TMS	ITS*	HAA	ROI	C	C*	MC	B	B*	F	S	Local Weight
PF	PC	0.8889	0.8889	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.8889
	CS	0.1111	0.1111	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1111
TF	TR	0.0000	0.0000	0.0547	0.0120	0.2692	0.0769	0.2692	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1364
	ITI	0.0000	0.0000	0.4375	0.0964	0.3077	0.0769	0.3077	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2452
	PITK	0.0000	0.0000	0.0078	0.0120	0.0385	0.0769	0.0385	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0347
	ITS	0.0000	0.0000	0.4921	0.8675	0.3462	0.6923	0.3462	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.5488
	DSP	0.0000	0.0000	0.0078	0.0120	0.0385	0.0769	0.0385	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0347
SF	TMS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.8182	0.8889	0.5000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.7357
	ITS*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0909	0.0988	0.4444	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2114
	HAA	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0909	0.0123	0.0556	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0529
FF	ROI	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1000	0.1000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1000
	C	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.9000	0.9000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.9000
OF	C*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0368	0.0714	0.0109	0.0109	0.1579	0.0368	0.0541
	MC	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.3313	0.6429	0.7912	0.7912	0.2368	0.3313	0.5208
	B	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2945	0.0714	0.0879	0.0879	0.2105	0.2945	0.1745
	B*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2945	0.0714	0.0879	0.0879	0.2105	0.2945	0.1745
	F	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0061	0.0714	0.0109	0.0109	0.0263	0.0061	0.0219
	S	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0368	0.0714	0.0109	0.0109	0.1579	0.0368	0.0541

Table D.7b: Normalised Numerical Ranking of Factors (Local Weights) on Proposal Phase by SDSE in LGA_A CICTD (Step 3)

		TF		SF			FF		OF				
	AD	TR	PITK	TMS	ITS*	HAA	ROI	C	C*	MC	B	B*	S
TF	TR	1	8	0	0	0	0	0	0	0	0	0	0
	PITK	1/8	1	0	0	0	0	0	0	0	0	0	0
SF	TMS	0	0	1	9	9	0	0	0	0	0	0	0
	ITS*	0	0	1/9	1	8	0	0	0	0	0	0	0
	HAA	0	0	1/9	1/8	1	0	0	0	0	0	0	0
FF	ROI	0	0	0	0	0	1	1/9	0	0	0	0	0
	C	0	0	0	0	0	9	1	0	0	0	0	0
OF	C*	0	0	0	0	0	0	0	1	1/8	1/9	1/8	1
	MC	0	0	0	0	0	0	0	8	1	1/9	1	8
	B	0	0	0	0	0	0	0	9	9	1	9	9
	B*	0	0	0	0	0	0	0	8	1	1/9	1	8
	S	0	0	0	0	0	0	0	1	1/8	1/9	1/8	1

Table D.8: Pairwise Numerical Ranking of Factors on Adoption Decision Phase by SDSE in LGA_A CICTD (Step 2)

		TF		SF			FF		OF					Local
	AD	TR	PITK	TMS	ITS*	HAA	ROI	C	C*	MC	B	B*	S	**Weight**
TF	TR	0.8889	0.8889	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.8889
	PITK	0.1111	0.1111	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1111
SF	TMS	0.0000	0.0000	0.8182	0.8889	0.5000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.7357
	ITS*	0.0000	0.0000	0.0909	0.0988	0.4444	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2114
	HAA	0.0000	0.0000	0.0909	0.0123	0.0556	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0529
FF	ROI	0.0000	0.0000	0.0000	0.0000	0.0000	0.1000	0.1000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1000
	C	0.0000	0.0000	0.0000	0.0000	0.0000	0.9000	0.9000	0.0000	0.0000	0.0000	0.0000	0.0000	0.9000
OF	C*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0370	0.0111	0.0769	0.0111	0.0370	0.0346
	MC	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2963	0.0889	0.0769	0.0889	0.2963	0.1695
	B	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.3333	0.8000	0.6923	0.8000	0.3333	0.5918
	B*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2963	0.0889	0.0769	0.0889	0.2963	0.1695
	S	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0370	0.0111	0.0769	0.0111	0.0370	0.0346

Table D.8b: Normalised Numerical Ranking of Factors (Local Weights) on Adoption Decision Phase by SDSE in LGA_A CICTD (Step 3)

		PF			SF		FF	OF	
	M	PC	CS	CM	TMS	HAA	ROI	B*	S
PF	PC	**1**	5	5	0	0	0	0	0
	CS	1/5	**1**	3	0	0	0	0	0
	CM	1/5	1/3	**1**	0	0	0	0	0
SF	TMS	0	0	0	**1**	9	0	0	0
	HAA	0	0	0	1/9	**1**	0	0	0
FF	ROI	0	0	0	0	0	**1**	0	0
OF	B*	0	0	0	0	0	0	**1**	7
	S	0	0	0	0	0	0	1/7	**1**

Table D.9: Pairwise Numerical Ranking of Factors on Motivation Phase by SDMA in LGA_A CICTD (Step 2)

		PF			SF		FF	OF		Local Weight
	M	PC	CS	CM	TMS	HAA	ROI	B*	S	
PF	PC	0.7143	0.7895	0.5556	0.0000	0.0000	0.0000	0.0000	0.0000	0.6866
	CS	0.1429	0.1579	0.3333	0.0000	0.0000	0.0000	0.0000	0.0000	0.2134
	CM	0.1429	0.0526	0.1111	0.0000	0.0000	0.0000	0.0000	0.0000	0.1022
SF	TMS	0.0000	0.0000	0.0000	0.9000	0.9000	0.0000	0.0000	0.0000	0.9000
	HAA	0.0000	0.0000	0.0000	0.1000	0.1000	0.0000	0.0000	0.0000	0.1000
FF	ROI	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
OF	B*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.8750	0.8750	0.8750
	S	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1249	0.1249	0.1249

Table D.9b: Normalised Numerical Ranking of Factors (Local Weights) on Motivation Phase by SDMA in LGA_A CICTD (Step 3)

		PF		TF					SF		FF	OF		
	C	CM	MK	TR	ITI	PITK	ITS	DSP	ITS*	HAA	ROI	C*	MC	S
PF	CM	**1**	5	0	0	0	0	0	0	0	0	0	0	0
	MK	1/5	**1**	0	0	0	0	0	0	0	0	0	0	0
TF	TR	0	0	**1**	1/5	1/6	1/7	4	0	0	0	0	0	0
	ITI	0	0	5	**1**	1/6	1/7	5	0	0	0	0	0	0
	PITK	0	0	6	6	**1**	1/7	6	0	0	0	0	0	0
	ITS	0	0	7	7	7	**1**	7	0	0	0	0	0	0
	DSP	0	0	1/4	1/5	1/6	1/7	**1**	0	0	0	0	0	0
SF	ITS*	0	0	0	0	0	0	0	**1**	7	0	0	0	0
	HAA	0	0	0	0	0	0	0	1/7	**1**	0	0	0	0
FF	ROI	0	0	0	0	0	0	0	0	0	**1**	0	0	0
OF	C*	0	0	0	0	0	0	0	0	0	0	**1**	1/9	1/6
	MC	0	0	0	0	0	0	0	0	0	0	9	**1**	9
	S	0	0	0	0	0	0	0	0	0	0	6	1/9	**1**

Table D.10: Pairwise Numerical Ranking of Factors on Conception Phase by SDMA in LGA_A CICTD (Step 2)

		PF		TF					SF		FF	OF			Local Weight
	C	CM	MK	TR	ITI	PITK	ITS	DSP	ITS*	HAA	ROI	C*	MC	S	
PF	CM	0.8333	0.8333	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.8333
	MK	0.1667	0.1667	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1667
TF	TR	0.0000	0.0000	0.0519	0.0138	0.0196	0.0908	0.1739	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0700
	ITI	0.0000	0.0000	0.2597	0.0694	0.0196	0.0908	0.2174	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1314
	PITK	0.0000	0.0000	0.3117	0.4167	0.1176	0.0908	0.2608	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2395
	ITS	0.0000	0.0000	0.3636	0.4861	0.8235	0.6364	0.3043	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.5227
	DSP	0.0000	0.0000	0.0129	0.0138	0.0196	0.0908	0.0434	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0361
SF	ITS*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.8750	0.8750	0.0000	0.0000	0.0000	0.0000	0.8750
	HAA	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1249	0.1249	0.0000	0.0000	0.0000	0.0000	0.1249
FF	ROI	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
OF	C*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0625	0.0909	0.0164	0.0566
	MC	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.5625	0.8182	0.8852	0.7553
	S	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.3750	0.0909	0.0983	0.1881

Table D.10b: Normalised Numerical Ranking of Factors (Local Weights) on Conception Phase by SDMA in LGA_A CICTD (Step 3)

		PF		SF	FF		OF			
	P	TR	ITI	ITS*	ROI	C	MC	B	B*	F
TF	TR	**1**	8	0	0	0	0	0	0	0
	ITI	1/8	**1**	0	0	0	0	0	0	0
SF	ITS*	0	0	**1**	0	0	0	0	0	0
FF	ROI	0	0	0	**1**	1/9	0	0	0	0
	C	0	0	0	9	**1**	0	0	0	0
OF	MC	0	0	0	0	0	**1**	9	9	9
	B	0	0	0	0	0	1/9	**1**	8	8
	B*	0	0	0	0	0	1/9	1/8	**1**	7
	F	0	0	0	0	0	1/9	1/8	1/7	**1**

Table D.11: Pairwise Numerical Ranking of Factors on Proposal Phase by SDMA in LGA_A CICTD (Step 2)

		PF		SF	FF		OF				Local Weight
	P	TR	ITI	ITS*	ROI	C	MC	B	B*	F	
TF	TR	0.8889	0.8889	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.8889
	ITI	0.1111	0.1111	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1111
SF	ITS*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
FF	ROI	0.0000	0.0000	0.0000	0.1000	0.1000	0.0000	0.0000	0.0000	0.0000	0.1000
	C	0.0000	0.0000	0.0000	0.9000	0.9000	0.0000	0.0000	0.0000	0.0000	0.9000
OF	MC	0.0000	0.0000	0.0000	0.0000	0.0000	0.7500	0.8780	0.4960	0.3600	0.6210
	B	0.0000	0.0000	0.0000	0.0000	0.0000	0.0833	0.0975	0.4409	0.3200	0.2354
	B*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0833	0.0122	0.0551	0.2800	0.1076
	F	0.0000	0.0000	0.0000	0.0000	0.0000	0.0833	0.0122	0.0078	0.0400	0.0358

Table D.11b: Normalised Numerical Ranking of Factors (Local Weights) on Proposal Phase by SDMA in LGA_A CICTD (Step 3)

		PF	SF		FF		OF		
	AD	TR	TMS	ITS*	ROI	C	MC	B	B*
TF	TR	1	0	0	0	0	0	0	0
SF	TMS	0	1	9	0	0	0	0	0
	ITS*	0	1/9	1	0	0	0	0	0
FF	ROI	0	0	0	1	1/9	0	0	0
	C	0	0	0	9	1	0	0	0
OF	MC	0	0	0	0	0	1	9	9
	B	0	0	0	0	0	1/9	1	8
	B*	0	0	0	0	0	1/9	1/8	1

Table D.12: Pairwise Numerical Ranking of Factors on Adoption Decision Phase by SDMA in LGA_A CICTD (Step 2)

		PF	SF		FF		OF			Local Weight
	AD	TR	TMS	ITS*	ROI	C	MC	B	B*	
TF	TR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
SF	TMS	0.0000	0.9000	0.9000	0.0000	0.0000	0.0000	0.0000	0.0000	0.9000
	ITS*	0.0000	0.1000	0.1000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1000
FF	ROI	0.0000	0.0000	0.0000	0.1000	0.1000	0.0000	0.0000	0.0000	0.1000
	C	0.0000	0.0000	0.0000	0.9000	0.9000	0.0000	0.0000	0.0000	0.9000
OF	MC	0.0000	0.0000	0.0000	0.0000	0.0000	0.8182	0.8889	0.5000	0.7357
	B	0.0000	0.0000	0.0000	0.0000	0.0000	0.0909	0.0987	0.4444	0.2113
	B*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0909	0.0123	0.0556	0.0529

Table D.12b: Normalised Numerical Ranking of Factors (Local Weights) on Adoption Decision Phase by SDMA in LGA_A CICTD (Step 3)

		PF		TF			SF	OF
	M	PC	CM	ITI	ITS	DSP	TMS	B
PF	PC	**1**	7	0	0	0	0	0
	CM	1/7	**1**	0	0	0	0	0
TF	ITI	0	0	**1**	1/8	1/4	0	0
	ITS	0	0	8	**1**	9	0	0
	DSP	0	0	4	1/9	**1**	0	0
SF	TMS	0	0	0	0	0	**1**	0
OF	B	0	0	0	0	0	0	**1**

Table D.13: Pairwise Numerical Ranking of Factors on Motivation Phase by HIT at LGA_A CSD (Step 2)

		PF		SF			FF	OF	Local Weight
	M	PC	CS	ITI	ITS	DSP	TMS	B	
PF	PC	0.8750	0.8750	0.0000	0.0000	0.0000	0.0000	0.0000	0.8750
	CM	0.1249	0.1249	0.0000	0.0000	0.0000	0.0000	0.0000	0.1249
SF	ITI	0.0000	0.0000	0.0769	0.1011	0.0244	0.0000	0.0000	0.0675
	ITS	0.0000	0.0000	0.6154	0.8089	0.8780	0.0000	0.0000	0.7674
	DSP	0.0000	0.0000	0.3077	0.0898	0.0975	0.0000	0.0000	0.1650
FF	TMS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
OF	B	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Table D.13b: Normalised Numerical Ranking of Factors (Local Weights) on Motivation Phase by HIT in LGA_A CSD (Step 3)

		F	TF				SF
	C	CM	ITI	PITK	ITS	DSP	ITS*
PF	CM	**1**	0	0	0	0	0
TF	ITI	0	**1**	1/9	1/8	1/4	0
	PITK	0	9	**1**	9	8	0
	ITS	0	8	1/9	**1**	7	0
	DSP	0	4	1/8	1/7	**1**	0
SF	ITS*	0	0	0	0	0	**1**

Table D.14: Pairwise Numerical Ranking of Factors on Conception Phase by HIT in LGA_A CSD (Step 2)

		PF	SF				FF	Local Weight
	C	CM	ITI	PITK	ITS	DSP	ITS*	
PF	CM	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
SF	ITI	0.0000	0.0454	0.0825	0.0122	0.0154	0.0000	0.0388
	PITK	0.0000	0.4091	0.7422	0.8765	0.4923	0.0000	0.6300
	ITS	0.0000	0.3636	0.0825	0.0974	0.4308	0.0000	0.2435
	DSP	0.0000	0.1818	0.0927	0.0139	0.0615	0.0000	0.0875
	ITS*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Table D.14b: Normalised Numerical Ranking of Factors (Local Weights) on Conception Phase by HIT in LGA_A CSD (Step 3)

		PF		TF				SF	OF		
	P	PC	MK	TR	ITI	PITK	DSP	ITS*	MC	B	F
PF	PC	1	9	0	0	0	0	0	0	0	0
	MK	1/9	1	0	0	0	0	0	0	0	0
TF	TR	0	0	1	7	1/7	6	0	0	0	0
	ITI	0	0	1/7	1	1/7	1/5	0	0	0	0
	PITK	0	0	7	7	1	7	0	0	0	0
	DSP	0	0	1/6	5	1/7	1	0	0	0	0
FF	ITS*	0	0	0	0	0	0	1	0	0	0
OF	MC	0	0	0	0	0	0	0	1	8	8
	B	0	0	0	0	0	0	0	1/8	1	1/6
	F	0	0	0	0	0	0	0	1/8	6	1

Table D.15: Pairwise Numerical Ranking of Factors on Proposal Phase by HIT in LGA_A CSD (Step 2)

		PF		TF				SF	OF			Local Weight
	P	PC	MK	TR	ITI	PITK	DSP	ITS*	MC	B	F	
PF	PC	0.9000	0.9000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.9000
	MK	0.1000	0.1000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1000
TF	TR	0.0000	0.0000	0.1203	0.3500	0.0999	0.4225	0.0000	0.0000	0.0000	0.0000	0.2481
	ITI	0.0000	0.0000	0.0172	0.0500	0.0999	0.0141	0.0000	0.0000	0.0000	0.0000	0.0453
	PITK	0.0000	0.0000	0.8424	0.3500	0.7000	0.4929	0.0000	0.0000	0.0000	0.0000	0.5963
	DSP	0.0000	0.0000	0.0201	0.2500	0.0999	0.0704	0.0000	0.0000	0.0000	0.0000	0.1101
SF	ITS*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
OF	MC	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.8000	0.5333	0.8727	0.7353
	B	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1000	0.0667	0.0182	0.0616
	F	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1000	0.4000	0.1091	0.2030

Table D.15b: Normalised Numerical Ranking of Factors (Local Weights) on Proposal Phase by HIT in LGA_A CSD (Step 3)

		PF	TF		SF			FF	OF				
	AD	PC	TR	PITK	TMS	ITS*	HAA	C	C*	MC	B	B*	S
PF	PC	1	0	0	0	0	0	0	0	0	0	0	0
TF	TR	0	1	1/7	0	0	0	0	0	0	0	0	0
	PITK	0	7	1	0	0	0	0	0	0	0	0	0
SF	TMS	0	0	0	1	4	3	0	0	0	0	0	0
	ITS*	0	0	0	1/4	1	1/7	0	0	0	0	0	0
	HAA	0	0	0	1/3	7	1	0	0	0	0	0	0
FF	C	0	0	0	0	0	0	1	0	0	0	0	0
OF	C*	0	0	0	0	0	0	0	1	1/5	1/7	1/6	1/5
	MC	0	0	0	0	0	0	0	5	1	9	9	9
	B	0	0	0	0	0	0	0	7	1/9	1	1/8	7
	B*	0	0	0	0	0	0	0	6	1/9	8	1	7
	S	0	0	0	0	0	0	0	5	1/9	1/7	1/7	1

Table D.16: Pairwise Numerical Ranking of Factors on Adoption Decision Phase by HIT in LGA_A CSD (Step 2)

		PF	TF		SF			FF	OF					Local
	AD	PC	TR	PITK	TMS	ITS*	HAA	C	C*	MC	B	B*	S	Weight
PF	PC	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
TF	TR	0.0000	0.1250	0.1250	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1250
	PITK	0.0000	0.8750	0.8750	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.8750
SF	TMS	0.0000	0.0000	0.0000	0.6316	0.3333	0.6798	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.5482
	ITS*	0.0000	0.0000	0.0000	0.1579	0.0833	0.0345	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0919
	HAA	0.0000	0.0000	0.0000	0.2105	0.5833	0.2414	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.3451
FF	C	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
OF	C*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0417	0.1304	0.0078	0.0159	0.0083	0.0408
	MC	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2083	0.6522	0.4922	0.8625	0.3719	0.5174
	B	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2917	0.0724	0.0547	0.0119	0.2892	0.1439
	B*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.0724	0.4375	0.0958	0.2892	0.2289
	S	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2083	0.0724	0.0078	0.0137	0.0413	0.0687

Table D.16b: Normalised Numerical Ranking of Factors (Local Weights) on Adoption Decision Phase by HIT in LGA_A CSD (Step 3)

		PF		TF		SF	FF
	M	CS	CM	ITI	DSP	TMS	ROI
PF	CS	1	9	0	0	0	0
	CM	1/9	1	0	0	0	0
TF	ITI	0	0	1	1/7	0	0
	DSP	0	0	7	1	0	0
SF	TMS	0	0	0	0	1	0
FF	ROI	0	0	0	0	0	1

Table D.17: Pairwise Numerical Ranking of Factors on Motivation Phase by WM in LGA_A CSD (Step 2)

		PF		TF		SF	FF	Local Weight
	M	CS	CM	ITI	DSP	TMS	ROI	
PF	CS	0.9000	0.9000	0.0000	0.0000	0.0000	0.0000	0.9000
	CM	0.1000	0.1000	0.0000	0.0000	0.0000	0.0000	0.1000
TF	ITI	0.0000	0.0000	0.1250	0.1250	0.0000	0.0000	0.1250
	DSP	0.0000	0.0000	0.8750	0.8750	0.0000	0.0000	0.8750
SF	TMS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
FF	ROI	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Table D.17b: Normalised Numerical Ranking of Factors (Local Weights) on Motivation Phase by WM in LGA_A CSD (Step 3)

		TF		SF
	C	ITI	ITS	ITS*
PF	ITI	1	1/5	0
	ITS	5	1	0
SF	ITS*	0	0	1

Table D.18: Pairwise Numerical Ranking of Factors on Conception Phase by WM in LGA_A CSD (Step 2)

		PF		FF	Local Weight
	C	ITI	ITS	ITS*	
PF	ITI	0.1667	0.1667	0.0000	0.1667
	ITS	0.8333	0.8333	0.0000	0.8333
FF	ITS*	0.0000	0.0000	0.0000	0.0000

Table D.18b: Normalised Numerical Ranking of Factors (Local Weights) on Conception Phase by WM in LGA_A CSD (Step 3)

		PF		TF			SF	FF	OF		
	P	PC	MK	TR	PITK	DSP	ITS*	ROI	B	B*	F
PF	PC	1	9	0	0	0	0	0	0	0	0
PF	MK	1/9	1	0	0	0	0	0	0	0	0
TF	TR	0	0	1	8	8	0	0	0	0	0
TF	PITK	0	0	1/8	1	5	0	0	0	0	0
TF	DSP	0	0	1/8	1/5	1	0	0	0	0	0
SF	ITS*	0	0	0	0	0	1	0	0	0	0
FF	ROI	0	0	0	0	0	0	1	0	0	0
OF	B	0	0	0	0	0	0	0	1	8	8
OF	B*	0	0	0	0	0	0	0	1/8	1	7
OF	F	0	0	0	0	0	0	0	1/8	1/7	1

Table D.19: Pairwise Numerical Ranking of Factors on Proposal Phase by WM in LGA_A CSD (Step 2)

		PF		TF			SF	FF	OF			Local
	P	PC	MK	TR	PITK	DSP	ITS*	ROI	B	B*	F	Weight
PF	PC	0.9000	0.9000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.9000
PF	MK	0.1000	0.1000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1000
TF	TR	0.0000	0.0000	0.8000	0.8696	0.5714	0.0000	0.0000	0.0000	0.0000	0.0000	0.7470
TF	PITK	0.0000	0.0000	0.1000	0.1087	0.3571	0.0000	0.0000	0.0000	0.0000	0.0000	0.1886
TF	DSP	0.0000	0.0000	0.1000	0.0217	0.0714	0.0000	0.0000	0.0000	0.0000	0.0000	0.0644
SF	ITS*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
FF	ROI	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
OF	B	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.8000	0.8750	0.5000	0.7250
OF	B*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1000	0.1094	0.4667	0.2254
OF	F	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1000	0.0156	0.0625	0.0594

Table D.19b: Normalised Numerical Ranking of Factors (Local Weights) on Proposal Phase by WM in LGA_A CSD (Step 3)

		PF	TF		SF		FF	OF	
	AD	PC	TR	PITK	TMS	HAA	C	C*	S
PF	PC	1	0	0	0	0	0	0	0
TF	TR	0	1	8	0	0	0	0	0
TF	PITK	0	1/8	1	0	0	0	0	0
SF	TMS	0	0	0	1	9	0	0	0
SF	HAA	0	0	0	1/9	1	0	0	0
FF	C	0	0	0	0	0	1	0	0
OF	C*	0	0	0	0	0	0	1	5
OF	S	0	0	0	0	0	0	1/5	1

Table D.20: Pairwise Numerical Ranking of Factors on Adoption Decision Phase by WM in LGA_A CSD (Step 2)

		PF	TF		SF		FF	OF		Local Weight
	AD	PC	TR	PITK	TMS	HAA	C	C*	S	
PF	PC	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
TF	TR	0.0000	0.8889	0.8889	0.0000	0.0000	0.0000	0.0000	0.0000	0.8889
	PITK	0.0000	0.1111	0.1111	0.0000	0.0000	0.0000	0.0000	0.0000	0.1111
SF	TMS	0.0000	0.0000	0.0000	0.9000	0.9000	0.0000	0.0000	0.0000	0.9000
	HAA	0.0000	0.0000	0.0000	0.1000	0.1000	0.0000	0.0000	0.0000	0.1000
FF	C	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
OF	C*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.8333	0.8333	0.8333
	S	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1667	0.1667	0.1667

Table D.20b: Normalised Numerical Ranking of Factors (Local Weights) on Adoption Decision Phase by WM in LGA_A CSD (Step 3)

		PF			TF	SF	FF	OF
	M	PC	CS	CM	ITS	TMS	ROI	B
PF	PC	1	5	6	0	0	0	0
	CS	1/5	1	4	0	0	0	0
	CM	1/6	1/4	1	0	0	0	0
TF	ITS	0	0	0	1	0	0	0
SF	TMS	0	0	0	0	1	0	0
FF	ROI	0	0	0	0	0	1	0
OF	B	0	0	0	0	0	0	1

Table D.21: Pairwise Numerical Ranking of Factors on Motivation Phase by PM in LGA_A CSD (Step 2)

		PF			TF	SF	FF	OF	Local Weight
	M	PC	CS	CM	ITS	TMS	ROI	B	
PF	PC	0.7317	0.8000	0.5454	0.0000	0.0000	0.0000	0.0000	0.6924
	CS	0.1463	0.1600	0.3636	0.0000	0.0000	0.0000	0.0000	0.2233
	CM	0.1219	0.0400	0.0909	0.0000	0.0000	0.0000	0.0000	0.0843
TF	ITS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
SF	TMS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
FF	ROI	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
OF	B	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Table D.21b: Normalised Numerical Ranking of Factors (Local Weights) on Motivation Phase by PM in LGA_A CSD (Step 3)

		PF	TF				SF
	C	CM	ITI	PITK	ITS	DSP	ITS*
PF	CM	1	0	0	0	0	0
TF	ITI	0	1	1/6	1/7	5	0
	PITK	0	6	1	1/6	6	0
	ITS	0	7	6	1	7	0
	DSP	0	1/5	1/6	1/7	1	0
SF	ITS*	0	0	0	0	0	1

Table D.22: Pairwise Numerical Ranking of Factors on Conception Phase by PM in LGA_A CSD (Step 2)

		PF	SF				FF	Local
	C	CM	ITI	PITK	ITS	DSP	ITS*	Weight
PF	CM	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
TF	ITI	0.0000	0.0704	0.0227	0.0983	0.2631	0.0000	0.1136
	PITK	0.0000	0.4225	0.1364	0.1148	0.3158	0.0000	0.2474
	ITS	0.0000	0.4929	0.8182	0.6886	0.3684	0.0000	0.5920
	DSP	0.0000	0.0141	0.0227	0.0983	0.0526	0.0000	0.0469
SF	ITS*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Table D.22b: Normalised Numerical Ranking of Factors (Local Weights) on Conception Phase by PM in LGA_A CSD (Step 3)

		PF	TF			SF	FF	OF			
	P	PC	TR	ITI	DSP	ITS*	ROI	MC	B	B*	F
PF	PC	1	0	0	0	0	0	0	0	0	0
TF	TR	0	1	8	8	0	0	0	0	0	0
	ITI	0	1/8	1	6	0	0	0	0	0	0
	DSP	0	1/8	1/6	1	0	0	0	0	0	0
SF	ITS*	0	0	0	0	1	0	0	0	0	0
FF	ROI	0	0	0	0	0	1	0	0	0	0
OF	MC	0	0	0	0	0	0	1	9	9	9
	B	0	0	0	0	0	0	1/9	1	7	7
	B*	0	0	0	0	0	0	1/9	1/7	1	7
	F	0	0	0	0	0	0	1/9	1/7	1/7	1

Table C.23: Pairwise Numerical Ranking of Factors on Proposal Phase by PM in LGA_A CSD (Step 2)

		PF	TF			SF	FF	OF				Local
	P	PC	TR	ITI	DSP	ITS*	ROI	MC	B	B*	F	Weight
PF	PC	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
TF	TR	0.0000	0.8000	0.8727	0.5333	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.7353
	ITI	0.0000	0.1000	0.1091	0.4000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2030
	DSP	0.0000	0.1000	0.0182	0.0667	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0616
SF	ITS*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
FF	ROI	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
OF	MC	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.7500	0.8750	0.5250	0.3750	0.6312
	B	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0833	0.0972	0.4083	0.2917	0.2201
	B*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0833	0.0318	0.0583	0.2917	0.1163
	F	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0833	0.0318	0.0083	0.0417	0.0413

Table D.23b: Normalised Numerical Ranking of Factors (Local Weights) on Proposal Phase by PM in LGA_A CSD (Step 3)

		PF	TF	SF		FF	OF		
	AD	PC	TR	TMS	ITS*	C	MC	B	B*
PF	PC	1	0	0	0	0	0	0	0
TF	TR	0	1	0	0	0	0	0	0
SF	TMS	0	0	1	9	0	0	0	0
	ITS*	0	0	1/9	1	0	0	0	0
FF	C	0	0	0	0	1	0	0	0
OF	MC	0	0	0	0	0	1	8	9
	B	0	0	0	0	0	1/8	1	7
	B*	0	0	0	0	0	1/9	1/7	1

Table D.24: Pairwise Numerical Ranking of Factors on Adoption Decision Phase by PM in LGA_A CSD (Step 2)

		PF	TF	SF		FF	OF			Local
	AD	PC	TR	TMS	ITS*	C	MC	B	B*	Weight
PF	PC	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
TF	TR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
SF	TMS	0.0000	0.0000	0.9000	0.9000	0.0000	0.0000	0.0000	0.0000	0.9000
	ITS*	0.0000	0.0000	0.1000	0.1000	0.0000	0.0000	0.0000	0.0000	0.1000
FF	C	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
OF	MC	0.0000	0.0000	0.0000	0.0000	0.0000	0.8089	0.8750	0.5294	0.7377
	B	0.0000	0.0000	0.0000	0.0000	0.0000	0.1011	0.1094	0.4118	0.2074
	B*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0898	0.0156	0.0588	0.0547

Table D.24b: Normalised Numerical Ranking of Factors (Local Weights) on Adoption Decision Phase by PM in LGA_A CSD (Step 3)

		PF	TF	SF	FF		OF	
	M	PC	EF	HAA	ROI	C	B*	S
PF	PC	1	0	0	0	0	0	0
TF	EF	0	1	0	0	0	0	0
SF	HAA	0	0	1	0	0	0	0
FF	ROI	0	0	0	1	8	0	0
	C	0	0	0	1/8	1	0	0
OF	B*	0	0	0	0	0	1	8
	S	0	0	0	0	0	1/8	1

Table D.25: Pairwise Numerical Ranking of Factors on Motivation Phase by HIT in LGA_B (Step 2)

		PF	TF	SF	FF		OF		Local Weight
	M	PC	EF	HAA	ROI	C	B*	S	
PF	PC	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
TF	EF	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
SF	HAA	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
FF	ROI	0.0000	0.0000	0.0000	0.8889	0.8889	0.0000	0.0000	0.8889
	C	0.0000	0.0000	0.0000	0.1111	0.1111	0.0000	0.0000	0.1111
OF	B*	0.0000	0.0000	0.0000	0.0000	0.0000	0.8889	0.8889	0.8889
	S	0.0000	0.0000	0.0000	0.0000	0.0000	0.1111	0.1111	0.1111

Table D.25b: Normalised Numerical Ranking of Factors (Local Weights) on Motivation Phase by HIT in LGA_B (Step 3)

		PF		TF			SF	OF			
	C	PC	MK	ITI	PITK	ITS	TMS	C*	MC	B*	F
PF	PC	1	8	0	0	0	0	0	0	0	0
	MK	1/8	1	0	0	0	0	0	0	0	0
SF	ITI	0	0	1	7	1/8	0	0	0	0	0
	PITK	0	0	1/7	1	1/8	0	0	0	0	0
	ITS	0	0	8	8	1	0	0	0	0	0
FF	TMS	0	0	0	0	0	1	0	0	0	0
OF	C*	0	0	0	0	0	0	1	6	1/8	1/7
	MC	0	0	0	0	0	0	1/6	1	1/8	1/7
	B*	0	0	0	0	0	0	8	8	1	8
	F	0	0	0	0	0	0	7	7	1/8	1

Table D.26: Pairwise Numerical Ranking of Factors on Conception Phase by HIT in LGA_B (Step 2)

		PF		TF			SF	OF				Local
	C	PC	MK	ITI	PITK	ITS	TMS	C*	MC	B*	F	Weight
PF	PC	0.8889	0.8889	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.8889
	MK	0.1111	0.1111	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1111
TF	ITI	0.0000	0.0000	0.1094	0.4375	0.1000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2156
	PITK	0.0000	0.0000	0.0156	0.0625	0.1000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0594
	ITS	0.0000	0.0000	0.8750	0.5000	0.8000	0.0000	0.0000	0.0000	0.0000	0.0000	0.7250
SF	TMS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
OF	C*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0618	0.2727	0.0909	0.0154	0.1102
	MC	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0103	0.0454	0.0909	0.0154	0.0405
	B*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4948	0.3636	0.7273	0.8615	0.6118
	F	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4329	0.3182	0.0909	0.1077	0.2374

Table D.26b: Normalised Numerical Ranking of Factors (Local Weights) on Conception Phase by HIT in LGA_B (Step 3)

		F		TF			SF	FF		OF	
	P	PC	CM	EF	TR	DSP	ITS*	ROI	C	C*	B
PF	PC	1	6	0	0	0	0	0	0	0	0
	CM	1/6	1	0	0	0	0	0	0	0	0
TR	EF	0	0	1	8	8	0	0	0	0	0
	TR	0	0	1/8	1	6	0	0	0	0	0
	DSP	0	0	1/8	1/6	1	0	0	0	0	0
SF	ITS*	0	0	0	0	0	1	0	0	0	0
FF	ROI	0	0	0	0	0	0	1	8	0	0
	C	0	0	0	0	0	0	1/8	1	0	0
OF	C*	0	0	0	0	0	0	0	0	1	5
	B	0	0	0	0	0	0	0	0	1/5	1

Table D.27: Pairwise Numerical Ranking of Factors on Proposal Phase by HIT in LGA_B (Step 2)

		PF		TF			SF	FF		OF		Local
	P	PC	CM	EF	TR	DSP	ITS*	ROI	C	C*	B	Weight
PF	PC	0.8571	0.8571	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.8571
	CM	0.1428	0.1428	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1428
TF	EF	0.0000	0.0000	0.8000	0.8727	0.5333	0.0000	0.0000	0.0000	0.0000	0.0000	0.7353
	TR	0.0000	0.0000	0.1000	0.1091	0.4000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2030
	DSP	0.0000	0.0000	0.1000	0.0182	0.0667	0.0000	0.0000	0.0000	0.0000	0.0000	0.0616
SF	ITS*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
FF	ROI	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.8889	0.8889	0.0000	0.0000	0.8889
	C	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1111	0.1111	0.0000	0.0000	0.1111
OF	C*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.8333	0.8333	0.8333
	B	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1667	0.1667	0.1667

Table D.27b: Normalised Numerical Ranking of Factors (Local Weights) on Proposal Phase by HIT in LGA_B (Step 3)

		PF	TF		SF		FF		OF		
	AD	PC	ITI	ITS	TMS	HAA	ROI	C	C*	MC	B*
PF	PC	1	0	0	0	0	0	0	0	0	0
TR	ITI	0	1	1/6	0	0	0	0	0	0	0
	ITS	0	6	1	0	0	0	0	0	0	0
SF	TMS	0	0	0	1	9	0	0	0	0	0
	HAA	0	0	0	1/9	1	0	0	0	0	0
FF	ROI	0	0	0	0	0	1	9	0	0	0
	C	0	0	0	0	0	1/9	1	0	0	0
OF	C*	0	0	0	0	0	0	0	1	1/7	1/9
	MC	0	0	0	0	0	0	0	7	1	1/9
	B*	0	0	0	0	0	0	0	9	9	1

Table D.28: Pairwise Numerical Ranking of Factors on Adoption Decision Phase by HIT in LGA_B (Step 2)

		PF	TF		SF		FF		OF			Local Weight
	AD	PC	ITI	ITS	TMS	HAA	ROI	C	C*	MC	B*	
PF	PC	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
TF	ITI	0.0000	0.1428	0.1428	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1428
	ITS	0.0000	0.8571	0.8571	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.8571
SF	TMS	0.0000	0.0000	0.0000	0.9000	0.9000	0.0000	0.0000	0.0000	0.0000	0.0000	0.9000
	HAA	0.0000	0.0000	0.0000	0.0999	0.0999	0.0000	0.0000	0.0000	0.0000	0.0000	0.0999
FF	ROI	0.0000	0.0000	0.0000	0.0000	0.0000	0.9000	0.9000	0.0000	0.0000	0.0000	0.9000
	C	0.0000	0.0000	0.0000	0.0000	0.0000	0.0999	0.0999	0.0000	0.0000	0.0000	0.0999
OF	C*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0588	0.0141	0.0909	0.0546
	MC	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4117	0.0986	0.0909	0.2004
	B*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.5294	0.8873	0.8182	0.7449

Table D.28b: Normalised Numerical Ranking of Factors (Local Weights) on Adoption Decision Phase by HIT in LGA_B (Step 3)

		PF		TF		SF	FF	OF		
	M	PC	CM	PITK	ITS	HAA	ROI	B*	F	S
PF	PC	1	7	0	0	0	0	0	0	0
	CM	1/7	1	0	0	0	0	0	0	0
TR	PITK	0	0	1	1/8	0	0	0	0	0
	ITS	0	0	8	1	0	0	0	0	0
SF	HAA	0	0	0	0	1	0	0	0	0
FF	ROI	0	0	0	0	0	1	0	0	0
OF	B	0	0	0	0	0	0	1	9	9
	F	0	0	0	0	0	0	1/9	1	6
	S	0	0	0	0	0	0	1/9	1/6	1

Table D.29: Pairwise Numerical Ranking of Factors on Adoption Decision Phase by PM in LGA_B (Step 2)

		PF		TF		SF	FF	OF			Local
	M	PC	CM	PITK	ITS	HAA	ROI	B*	F	S	Weight
PF	PC	0.8750	0.8750	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.8750
	CM	0.1250	0.1250	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1250
TR	PITK	0.0000	0.0000	0.1111	0.1111	0.0000	0.0000	0.0000	0.0000	0.0000	0.1111
	ITS	0.0000	0.0000	0.8889	0.8889	0.0000	0.0000	0.0000	0.0000	0.0000	0.8889
SF	HAA	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
FF	ROI	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
OF	B	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.8182	0.8852	0.5625	0.7553
	F	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0909	0.0983	0.3750	0.1881
	S	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0909	0.0164	0.0625	0.0566

Table D.29b: Normalised Numerical Ranking of Factors (Local Weights) on Motivation Phase by PM in LGA_B (Step 3)

		PF			TF				SF		FF				
	C	PC	CM	MK	TR	ITI	PITK	ITS	TMS	ITS*	C*	MC	B	B*	F
PF	PC	1	8	8	0	0	0	0	0	0	0	0	0	0	0
	CM	1/8	1	1/6	0	0	0	0	0	0	0	0	0	0	0
	MK	1/8	6	1	0	0	0	0	0	0	0	0	0	0	0
TF	TR	0	0	0	1	1/7	6	1/8	0	0	0	0	0	0	0
	ITI	0	0	0	7	1	7	1/8	0	0	0	0	0	0	0
	PTIK	0	0	0	1/6	1/7	1	1/8	0	0	0	0	0	0	0
	ITS	0	0	0	8	8	8	1	0	0	0	0	0	0	0
SF	TMS	0	0	0	0	0	0	0	1	9	0	0	0	0	0
	ITS*	0	0	0	0	0	0	0	1/9	1	0	0	0	0	0
OF	C*	0	0	0	0	0	0	0	0	0	1	7	7	1/9	1/8
	MC	0	0	0	0	0	0	0	0	0	1/7	1	5	1/9	1/8
	B	0	0	0	0	0	0	0	0	0	1/7	1/5	1	1/9	1/8
	B*	0	0	0	0	0	0	0	0	0	9	9	9	1	9
	F	0	0	0	0	0	0	0	0	0	8	8	8	1/9	1

Table D.30: Pairwise Numerical Ranking of Factors on Conception Phase by PM in LGA_B (Step 2)

		PF			TF				SF		FF					Local
	C	PC	CM	MK	TR	ITI	PITK	ITS	TMS	ITS*	C*	MC	B	B*	F	Weight
PF	PC	0.8000	0.5333	0.8727	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.7353
	CM	0.1000	0.0667	0.0182	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0616
	MK	0.1000	0.4000	0.1091	0.4167	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2030
TF	TR	0.0000	0.0000	0.0196	0.0618	0.0154	0.2727	0.0909	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1102
	ITI	0.0000	0.0000	0.8235	0.4329	0.1077	0.3182	0.0909	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2374
	PTIK	0.0000	0.0000	0.0196	0.0103	0.0154	0.0454	0.0909	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0405
	ITS	0.0000	0.0000	0.0196	0.4948	0.8615	0.3636	0.7273	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.6118
SF	TMS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.9000	0.9000	0.0000	0.0000	0.0000	0.0000	0.0000	0.9000
	ITS*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1000	0.1000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1000
OF	C*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0547	0.2778	0.2333	0.0769	0.0121	0.1309
	MC	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0078	0.0397	0.1667	0.0769	0.0121	0.0606
	B	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0078	0.0079	0.0333	0.0769	0.0121	0.0276
	B*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4922	0.3571	0.3000	0.6923	0.8675	0.5418
	F	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4375	0.3174	0.2667	0.0769	0.0964	0.2389

Table D.30b: Normalised Numerical Ranking of Factors (Local Weights) on Conception Phase by PM in LGA_B (Step 3)

		PF	TF						SF		FF		OF				
	P	PC	EF	TR	ITI	PTIK	ITS	DSP	ITS*	HAA	ROI	C	C*	MC	B	B*	F
PF	PC	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TF	EF	0	1	9	9	9	9	9	0	0	0	0	0	0	0	0	0
	TR	0	1/9	1	6	6	1/7	6	0	0	0	0	0	0	0	0	0
	ITI	0	1/9	1/6	1	5	1/7	5	0	0	0	0	0	0	0	0	0
	PITK	0	1/9	1/6	1/5	1	1/7	1/4	0	0	0	0	0	0	0	0	0
	ITS	0	1/9	7	7	7	1	7	0	0	0	0	0	0	0	0	0
	DSP	0	1/9	1/6	1/5	4	1/7	1	0	0	0	0	0	0	0	0	0
SF	ITS*	0	0	0	0	0	0	0	1	1/9	0	0	0	0	0	0	0
	HAA	0	0	0	0	0	0	0	9	1	0	0	0	0	0	0	0
FF	ROI	0	0	0	0	0	0	0	0	0	1	8	0	0	0	0	0
	C	0	0	0	0	0	0	0	0	0	1/8	1	0	0	0	0	0
OF	C*	0	0	0	0	0	0	0	0	0	0	0	1	1/6	5	1/8	1/7
	MC	0	0	0	0	0	0	0	0	0	0	0	6	1	6	1/8	1/7
	B	0	0	0	0	0	0	0	0	0	0	0	1/5	1/6	1	1/8	1/7
	B*	0	0	0	0	0	0	0	0	0	0	0	8	8	8	1	8
	F	0	0	0	0	0	0	0	0	0	0	0	7	7	7	1/8	1

Table D.31: Pairwise Numerical Ranking of Factors on Proposal Phase by PM in LGA_B (Step 2)

		PF	TF						SF		FF		OF					Local
	P	PC	EF	TR	ITI	PTIK	ITS	DSP	ITS*	HAA	ROI	C	C*	MC	B	B*	F	Weight
PF	PC	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
TF	EF	0.0000	0.6431	0.5143	0.3846	0.2812	0.8513	0.3185	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4988
	TR	0.0000	0.0714	0.0571	0.2564	0.1875	0.0135	0.2124	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1330
	ITI	0.0000	0.0714	0.0095	0.0427	0.1562	0.0135	0.1769	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0784
	PITK	0.0000	0.0714	0.0095	0.0085	0.0313	0.0135	0.0088	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0238
	ITS	0.0000	0.0714	0.3980	0.2991	0.2188	0.0946	0.2477	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2216
	DSP	0.0000	0.0714	0.0095	0.0085	0.1250	0.0135	0.0354	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0439
SF	ITS*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1000	0.1000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1000
	HAA	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.9000	0.9000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.9000
FF	ROI	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.8889	0.8889	0.0000	0.0000	0.0000	0.0000	0.0000	0.8889
	C	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1111	0.1111	0.0000	0.0000	0.0000	0.0000	0.0000	0.1111
OF	C*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0450	0.0102	0.1852	0.0833	0.0151	0.0677
	MC	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2702	0.0612	0.2222	0.0833	0.0151	0.1304
	B	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0090	0.0102	0.0370	0.0833	0.0151	0.0309
	B*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.3604	0.4897	0.2963	0.6667	0.8485	0.5323
	F	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.3153	0.4285	0.2593	0.0833	0.1061	0.2385

Table D.31b: Normalised Numerical Ranking of Factors (Local Weights) on Proposal Phase by PM in LGA_B (Step 3)

		PF	TF			SF		FF		OF			
	AD	PC	TR	ITI	ITS	TMS	HAA	ROI	C	C*	MC	B	B*
PF	PC	**1**	0	0	0	0	0	0	0	0	0	0	0
TF	TR	0	**1**	6	1/7	0	0	0	0	0	0	0	0
	ITI	0	1/6	**1**	1/7	0	0	0	0	0	0	0	0
	ITS	0	7	7	**1**	0	0	0	0	0	0	0	0
SF	TMS	0	0	0	0	**1**	9	0	0	0	0	0	0
	HAA	0	0	0	0	1/9	**1**	0	0	0	0	0	0
FF	ROI	0	0	0	0	0	0	**1**	9	0	0	0	0
	C	0	0	0	0	0	0	1/9	**1**	0	0	0	0
OF	C*	0	0	0	0	0	0	0	0	**1**	1/8	6	1/9
	MC	0	0	0	0	0	0	0	0	8	**1**	8	1/9
	B	0	0	0	0	0	0	0	0	1/6	1/8	**1**	1/9
	B*	0	0	0	0	0	0	0	0	9	9	9	**1**

Table D.32: Pairwise Numerical Ranking of Factors on Adoption Decision Phase by PM in LGA_B (Step 2)

		PF	TF			SF		FF		OF				Local
	AD	PC	TR	ITI	ITS	TMS	HAA	ROI	C	C*	MC	B	B*	Weight
PF	PC	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
TF	TR	0.0000	0.1224	0.4285	0.1111	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2207
	ITI	0.0000	0.0204	0.0714	0.1111	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0676
	ITS	0.0000	0.8571	0.5000	0.7778	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.7116
SF	TMS	0.0000	0.0000	0.0000	0.0000	0.9000	0.9000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.9000
	HAA	0.0000	0.0000	0.0000	0.0000	0.1000	0.1000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1000
FF	ROI	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.9000	0.9000	0.0000	0.0000	0.0000	0.0000	0.9000
	C	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1000	0.1000	0.0000	0.0000	0.0000	0.0000	0.1000
OF	C*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0550	0.0122	0.2500	0.0833	0.1001
	MC	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4404	0.0975	0.3333	0.0833	0.2386
	B	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0092	0.0122	0.0417	0.0833	0.0366
	B*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4954	0.8780	0.3750	0.7500	0.6246

Table D.32b: Normalised Numerical Ranking of Factors (Local Weights) on Adoption Decision Phase by PM in LGA_B (Step 3)

		PF		TF			SF	FF		OF			
	M	PC	CM	EF	PITK	ITS	HAA	ROI	C	B	B*	F	S
PF	PC	1	6	0	0	0	0	0	0	0	0	0	0
	CM	1/6	1	0	0	0	0	0	0	0	0	0	0
TF	EF	0	0	1	1/8	1/7	0	0	0	0	0	0	0
	PITK	0	0	8	1	8	0	0	0	0	0	0	0
	ITS	0	0	7	1/8	1	0	0	0	0	0	0	0
SF	HAA	0	0	0	0	0	1	0	0	0	0	0	0
FF	ROI	0	0	0	0	0	0	1	1/4	0	0	0	0
	C	0	0	0	0	0	0	4	1	0	0	0	0
OF	B	0	0	0	0	0	0	0	0	1	5	5	5
	B*	0	0	0	0	0	0	0	0	1/5	1	4	4
	F	0	0	0	0	0	0	0	0	1/5	1/4	1	2
	S	0	0	0	0	0	0	0	0	1/5	1/4	1/2	1

Table D.33: Pairwise Numerical Ranking of Factors on Motivation Phase by SSD in LGA_B (Step 2)

		PF		TF			SF	FF		OF				Local
	M	PC	CM	EF	PITK	ITS	HAA	ROI	C	B	B*	F	S	Weight
PF	PC	0.8571	0.8571	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.8571
	CM	0.1428	0.1428	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1428
TF	EF	0.0000	0.0000	0.0625	0.1000	0.0156	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0594
	PITK	0.0000	0.0000	0.5000	0.8000	0.8750	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.7250
	ITS	0.0000	0.0000	0.4375	0.1000	0.1094	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2156
SF	HAA	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
FF	ROI	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2000	0.2000	0.0000	0.0000	0.0000	0.0000	0.2000
	C	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.8000	0.8000	0.0000	0.0000	0.0000	0.0000	0.8000
OF	B	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.6250	0.7692	0.4762	0.4167	0.5718
	B*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1250	0.1538	0.3809	0.3333	0.2482
	F	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1250	0.0384	0.0952	0.1667	0.1063
	S	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1250	0.0384	0.0476	0.0833	0.0735

Table D.33b: Normalised Numerical Ranking of Factors (Local Weights) on Motivation Phase by SSD in LGA_B (Step 3)

		PF			TF				SF	FF				
	C	PC	CM	MK	TR	ITI	PITK	ITS	ITS*	C*	MC	B	B*	F
PF	PC	1	1/5	1/4	0	0	0	0	0	0	0	0	0	0
	CM	5	1	5	0	0	0	0	0	0	0	0	0	0
	MK	4	1/5	1	0	0	0	0	0	0	0	0	0	0
TF	TR	0	0	0	1	6	1/8	1/7	0	0	0	0	0	0
	ITI	0	0	0	1/6	1	1/8	1/7	0	0	0	0	0	0
	PTIK	0	0	0	8	8	1	8	0	0	0	0	0	0
	ITS	0	0	0	7	7	1/8	1	0	0	0	0	0	0
SF	ITS*	0	0	0	0	0	0	0	1	0	0	0	0	0
OF	C*	0	0	0	0	0	0	0	0	1	1/6	1/5	1/4	3
	MC	0	0	0	0	0	0	0	0	6	1	6	6	6
	B	0	0	0	0	0	0	0	0	5	1/6	1	5	5
	B*	0	0	0	0	0	0	0	0	4	1/6	1/5	1	4
	F	0	0	0	0	0	0	0	0	1/3	1/6	1/5	1/4	1

Table D.34: Pairwise Numerical Ranking of Factors on Conception Phase by SSD in LGA_B (Step 2)

		PF			TF				SF	FF					Local
	C	PC	CM	MK	TR	ITI	PITK	ITS	ITS*	C*	MC	B	B*	F	Weight
PF	PC	0.1000	0.1429	0.0400	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0943
	CM	0.5000	0.7143	0.8000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.6714
	MK	0.4000	0.1429	0.1600	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2343
TF	TR	0.0000	0.0000	0.0000	0.0618	0.2727	0.0909	0.0154	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1102
	ITI	0.0000	0.0000	0.0000	0.0103	0.0454	0.0909	0.0154	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0405
	PTIK	0.0000	0.0000	0.0000	0.4948	0.3636	0.7272	0.8615	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.6117
	ITS	0.0000	0.0000	0.0000	0.4329	0.3182	0.0909	0.1077	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2374
SF	ITS*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
OF	C*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0612	0.1000	0.0263	0.0200	0.1578	0.0731
	MC	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.3673	0.5999	0.7894	0.4800	0.3158	0.5105
	B	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.3061	0.1000	0.1315	0.4000	0.2631	0.2401
	B*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2448	0.1000	0.0263	0.0800	0.2105	0.1323
	F	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0204	0.1000	0.0263	0.0200	0.0526	0.0439

Table D.34b: Normalised Numerical Ranking of Factors (Local Weights) on Conception Phase by SSD in LGA_B (Step 3)

		PF		TF						SF		FF		OF				
	P	PC	CM	EF	TR	ITI	PTIK	ITS	DSP	ITS*	HAA	ROI	C	C*	MC	B	B*	F
PF	PC	1	1/6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	CM	6	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TF	EF	0	0	1	7	7	7	7	7	0	0	0	0	0	0	0	0	0
	TR	0	0	1/7	1	4	1/6	1/5	4	0	0	0	0	0	0	0	0	0
	ITI	0	0	1/7	1/4	1	1/6	1/5	3	0	0	0	0	0	0	0	0	0
	PITK	0	0	1/7	6	6	1	6	6	0	0	0	0	0	0	0	0	0
	ITS	0	0	1/7	5	5	1/6	1	5	0	0	0	0	0	0	0	0	0
	DSP	0	0	1/7	1/4	1/3	1/6	1/5	1	0	0	0	0	0	0	0	0	0
SF	ITS*	0	0	0	0	0	0	0	0	1	9	0	0	0	0	0	0	0
	HAA	0	0	0	0	0	0	0	0	1/9	1	0	0	0	0	0	0	0
FF	ROI	0	0	0	0	0	0	0	0	0	0	1	1/6	0	0	0	0	0
	C	0	0	0	0	0	0	0	0	0	0	6	1	0	0	0	0	0
OF	C*	0	0	0	0	0	0	0	0	0	0	0	0	1	1/9	1/8	1/7	6
	MC	0	0	0	0	0	0	0	0	0	0	0	0	9	1	9	9	9
	B	0	0	0	0	0	0	0	0	0	0	0	0	8	1/9	1	8	8
	B*	0	0	0	0	0	0	0	0	0	0	0	0	7	1/9	1/8	1	7
	F	0	0	0	0	0	0	0	0	0	0	0	0	1/6	1/9	1/8	1/7	1

Table D.35: Pairwise Numerical Ranking of Factors on Proposal Phase by SSD in LGA_B (Step 2)

		PF		TF						SF		FF		OF					Local
	P	PC	CM	EF	TR	ITI	PTIK	ITS	DSP	ITS*	HAA	ROI	C	C*	MC	B	B*	F	Weights
PF	PC	0.1428	0.1428	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1428
	CM	0.8571	0.8571	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.8571
TF	EF	0.0000	0.0000	0.5833	0.3589	0.3000	0.8075	0.4794	0.2692	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4664
	TR	0.0000	0.0000	0.0833	0.0512	0.1714	0.0192	0.0137	0.1538	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0821
	ITI	0.0000	0.0000	0.0833	0.0128	0.0429	0.0192	0.0137	0.1154	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0478
	PITK	0.0000	0.0000	0.0833	0.3077	0.2571	0.1154	0.4109	0.2307	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2342
	ITS	0.0000	0.0000	0.0833	0.2564	0.2253	0.0192	0.0684	0.1923	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1408
	DSP	0.0000	0.0000	0.0833	0.0128	0.0143	0.0192	0.0137	0.0385	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0303
SF	ITS*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.9000	0.9000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.9000
	HAA	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1000	0.1000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1000
FF	ROI	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1428	0.1428	0.0000	0.0000	0.0000	0.0000	0.0000	0.1428
	C	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.8571	0.8571	0.0000	0.0000	0.0000	0.0000	0.0000	0.8571
OF	C*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0397	0.0769	0.0120	0.0078	0.1935	0.0659
	MC	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.3576	0.6923	0.8674	0.4922	0.2903	0.5399
	B	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.3179	0.0769	0.0964	0.4375	0.2580	0.2373
	B*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2781	0.0769	0.0120	0.0547	0.2258	0.1295
	F	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0066	0.0769	0.0120	0.0078	0.0322	0.0271

Table D.35b: Normalised Numerical Ranking of Factors (Local Weights) on Proposal Phase by SSD in LGA_B (Step 3)

		PF	TF		SF		FF		OF		
	AD	PC	TR	ITS	TMS	HAA	ROI	C	C*	B	B*
PF	PC	1	0	0	0	0	0	0	0	0	0
TF	TR	0	1	4	0	0	0	0	0	0	0
	ITS	0	1/4	1	0	0	0	0	0	0	0
SF	TMS	0	0	0	1	1/9	0	0	0	0	0
	HAA	0	0	0	9	1	0	0	0	0	0
FF	ROI	0	0	0	0	0	1	1/8	0	0	0
	C	0	0	0	0	0	8	1	0	0	0
OF	C*	0	0	0	0	0	0	0	1	1/4	1/5
	B	0	0	0	0	0	0	0	4	1	1/5
	B*	0	0	0	0	0	0	0	5	5	1

Table D.36: Pairwise Numerical Ranking of Factors on Adoption Decision Phase by SSD in LGA_B (Step 2)

		PF	TF		SF		FF		OF			Local
	AD	PC	TR	ITS	TMS	HAA	ROI	C	C*	B	B*	Weight
PF	PC	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
TF	TR	0.0000	0.8000	0.8000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.8000
	ITS	0.0000	0.2000	0.2000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2000
SF	TMS	0.0000	0.0000	0.0000	0.1000	0.1000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1000
	HAA	0.0000	0.0000	0.0000	0.9000	0.9000	0.0000	0.0000	0.0000	0.0000	0.0000	0.9000
FF	ROI	0.0000	0.0000	0.0000	0.0000	0.0000	0.1111	0.1111	0.0000	0.0000	0.0000	0.1111
	C	0.0000	0.0000	0.0000	0.0000	0.0000	0.8890	0.8890	0.0000	0.0000	0.0000	0.8890
OF	C*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1000	0.0400	0.1429	0.0943
	B	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4000	0.1600	0.1429	0.2343
	B*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.5000	0.8000	0.7143	0.6714

Table D.36b: Normalised Numerical Ranking of Factors (Local Weights) on Adoption Decision Phase by SSD in LGA_B (Step 3)

		PF	TF		SF		FF	OF		
	M	PC	EF	PITK	TMS	HAA	C	B	B*	S
PF	PC	1	0	0	0	0	0	0	0	0
TF	EF	0	1	1/6	0	0	0	0	0	0
	PITK	0	6	1	0	0	0	0	0	0
SF	TMS	0	0	0	1	7	0	0	0	0
	HAA	0	0	0	1/7	1	0	0	0	0
FF	C	0	0	0	0	0	1	0	0	0
OF	B	0	0	0	0	0	0	1	1/7	6
	B*	0	0	0	0	0	0	7	1	7
	S	0	0	0	0	0	0	1/6	1/7	1

Table D.37: Pairwise Numerical Ranking of Factors on Motivation Phase by HICT in LGA_C (Step 2)

		PF	TF		SF		FF	OF			Local
	M	PC	EF	PITK	TMS	HAA	C	B	B*	S	Weight
PF	PC	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
TF	EF	0.0000	0.1428	0.1428	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1428
	PITK	0.0000	0.8571	0.8571	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.8571
SF	TMS	0.0000	0.0000	0.0000	0.8750	0.8750	0.0000	0.0000	0.0000	0.0000	0.8750
	HAA	0.0000	0.0000	0.0000	0.1250	0.1250	0.0000	0.0000	0.0000	0.0000	0.1250
FF	C	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
OF	B	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1224	0.1110	0.4285	0.2206
	B*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.8571	0.7778	0.5000	0.7116
	S	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0204	0.1110	0.0714	0.0676

Table D.37b: Normalised Numerical Ranking of Factors (Local Weights) on Motivation Phase by HICT in LGA_C (Step 3)

		TF				SF	OF
	C	ITI	PITK	ITS	DSP	ITS*	B*
TF	ITI	**1**	1/8	1/8	1	0	0
	PITK	8	**1**	1	8	0	0
	ITS	8	1	**1**	8	0	0
	DSP	1	1/8	1/8	**1**	0	0
SF	ITS*	0	0	0	0	**1**	0
OF	B*	0	0	0	0	0	**1**

Table D.38: Pairwise Numerical Ranking of Factors on Conception Phase by HICT in LGA_C (Step 2)

		SF				SF	OF	Local Weight
	C	ITI	PITK	ITS	DSP	ITS*	B*	
TF	ITI	0.0556	0.0556	0.0556	0.0556	0.0000	0.0000	0.0556
	PITK	0.4444	0.4444	0.4444	0.4444	0.0000	0.0000	0.4444
	ITS	0.4444	0.4444	0.4444	0.4444	0.0000	0.0000	0.4444
	DSP	0.0556	0.0556	0.0556	0.0556	0.0000	0.0000	0.0556
SF	ITS*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
OF	B*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Table D.38b: Normalised Numerical Ranking of Factors (Local Weights) on Conception Phase by HICT in LGA_C (Step 3)

		PF				TF					SF		FF		OF				
	P	PC	CS	CM	MK	EF	TR	ITI	PITK	ITS	TMS	ITS*	ROI	C	C*	MC	B	B*	F
PF	PC	**1**	8	8	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	CS	1/8	**1**	1	1/8	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	CM	1/8	1	**1**	1/8	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MK	1/8	8	8	**1**	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TF	EF	0	0	0	0	**1**	1	9	9	9	0	0	0	0	0	0	0	0	0
	TR	0	0	0	0	1	**1**	9	9	9	0	0	0	0	0	0	0	0	0
	ITI	0	0	0	0	1/9	1/9	**1**	8	8	0	0	0	0	0	0	0	0	0
	PITK	0	0	0	0	1/9	1/9	1/8	**1**	1	0	0	0	0	0	0	0	0	0
	ITS	0	0	0	0	1/9	1/9	1/8	1	**1**	0	0	0	0	0	0	0	0	0
SF	TMS	0	0	0	0	0	0	0	0	0	**1**	9	0	0	0	0	0	0	0
	ITS*	0	0	0	0	0	0	0	0	0	1/9	**1**	0	0	0	0	0	0	0
FF	ROI	0	0	0	0	0	0	0	0	0	0	0	**1**	9	0	0	0	0	0
	C	0	0	0	0	0	0	0	0	0	0	0	1/9	**1**	0	0	0	0	0
OF	C*	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**	1/6	1/6	1/6	1/6
	MC	0	0	0	0	0	0	0	0	0	0	0	0	0	6	**1**	7	1	7
	B	0	0	0	0	0	0	0	0	0	0	0	0	0	6	1/7	**1**	1/7	6
	B*	0	0	0	0	0	0	0	0	0	0	0	0	0	6	1	7	**1**	7
	F	0	0	0	0	0	0	0	0	0	0	0	0	0	6	1/7	1/6	1/7	**1**

Table D.39: Pairwise Numerical Ranking of Factors on Proposal Phase by HICT in LGA_C (Step 2)

		PF				TF					SF		FF		OF					Local Weight
	P	PC	CS	CM	MK	EF	TR	ITI	PITK	ITS	TMS	ITS*	ROI	C	C*	MC	B	B*	F	
PF	PC	0.7273	0.4444	0.4444	0.8649	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.6202
	CS	0.0909	0.0556	0.0556	0.0135	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0539
	CM	0.0909	0.0556	0.0556	0.0135	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0539
	MK	0.0909	0.4444	0.4444	0.1081	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2719
TF	EF	0.0000	0.0000	0.0000	0.0000	0.4285	0.4285	0.4675	0.3214	0.3214	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.3935
	TR	0.0000	0.0000	0.0000	0.0000	0.4285	0.4285	0.4675	0.3214	0.3214	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.3935
	ITI	0.0000	0.0000	0.0000	0.0000	0.0476	0.0476	0.0519	0.2857	0.2857	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1437
	PITK	0.0000	0.0000	0.0000	0.0000	0.0476	0.0476	0.0064	0.0357	0.0357	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0346
	ITS	0.0000	0.0000	0.0000	0.0000	0.0476	0.0476	0.0064	0.0357	0.0357	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0346
SF	TMS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.9000	0.9000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.9000
	ITS*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1000	0.1000	0.1000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1000
FF	ROI	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.9000	0.9000	0.9000	0.0000	0.0000	0.0000	0.0000	0.0000	0.9000
	C	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1000	0.1000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1000
OF	C*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0400	0.0679	0.0109	0.0679	0.0078	0.0389
	MC	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2400	0.4078	0.4565	0.4078	0.3307	0.3685
	B	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2400	0.0582	0.0652	0.0582	0.2834	0.1410
	B*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2400	0.4078	0.4565	0.4078	0.3307	0.3685
	F	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2400	0.0582	0.0109	0.0582	0.0472	0.0829

Table D.39b: Normalised Numerical Ranking of Factors (Local Weights) on Proposal Phase by HICT in LGA_C (Step 3)

		PF	TF	SF			FF		OF			
	AD	PC	TR	TMS	ITS*	HAA	ROI	C	C*	B	B*	S
PF	PC	1	0	0	0	0	0	0	0	0	0	0
TF	TR	0	1	0	0	0	0	0	0	0	0	0
SF	TMS	0	0	1	9	9	0	0	0	0	0	0
	ITS*	0	0	1/9	1	8	0	0	0	0	0	0
	HAA	0	0	1/9	1/8	1	0	0	0	0	0	0
FF	ROI	0	0	0	0	0	1	9	0	0	0	0
	C	0	0	0	0	0	1/9	1	0	0	0	0
OF	C*	0	0	0	0	0	0	0	1	1/6	1/6	1
	B	0	0	0	0	0	0	0	6	1	1	6
	B*	0	0	0	0	0	0	0	6	1	1	6
	S	0	0	0	0	0	0	0	1	1/6	1/6	1

Table D.40: Pairwise Numerical Ranking of Factors on Adoption Decision Phase by HICT in LGA_C (Step 2)

		PF	TF	SF			FF		OF				Local Weight
	AD	PC	TR	TMS	ITS*	HAA	ROI	C	C*	B	B*	S	
PF	PC	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
TF	TR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
SF	TMS	0.0000	0.0000	0.8181	0.8889	0.5000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.7356
	ITS*	0.0000	0.0000	0.0909	0.0987	0.4444	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2113
	HAA	0.0000	0.0000	0.0909	0.0123	0.0556	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0529
FF	ROI	0.0000	0.0000	0.0000	0.0000	0.0000	0.9000	0.9000	0.0000	0.0000	0.0000	0.0000	0.9000
	C	0.0000	0.0000	0.0000	0.0000	0.0000	0.1000	0.1000	0.0000	0.0000	0.0000	0.0000	0.1000
OF	C*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0714	0.0714	0.0714	0.0714	0.0714
	B	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4285	0.4285	0.4285	0.4285	0.4285
	B*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4285	0.4285	0.4285	0.4285	0.4285
	S	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0714	0.0714	0.0714	0.0714	0.0714

Table D.40b: Normalised Numerical Ranking of Factors (Local Weights) on Adoption Decision Phase by HICT in LGA_C (Step 3)

		TF		SF			OF
	M	PC	CS	TMS	HAA	B*	S
TF	PC	1	8	0	0	0	0
	CS	1/8	1	0	0	0	0
SF	TMS	0	0	1	7	0	0
	HAA	0	0	1/7	1	0	0
SF	B*	0	0	0	0	1	7
OF	S	0	0	0	0	1/7	1

Table D.41: Pairwise Numerical Ranking of Factors on Motivation Phase by DSM in LGA_C (Step 2)

		SF		SF		OF		Local Weight
	M	PC	CS	TMS	HAA	B*	S	
TF	PC	0.8890	0.8890	0.0000	0.0000	0.0000	0.0000	0.8890
	CS	0.1111	0.1111	0.0000	0.0000	0.0000	0.0000	0.1111
SF	TMS	0.0000	0.0000	0.8750	0.8750	0.0000	0.0000	0.8750
	HAA	0.0000	0.0000	0.1250	0.1250	0.0000	0.0000	0.1250
OF	B*	0.0000	0.0000	0.0000	0.0000	0.8750	0.8750	0.8750
	S	0.0000	0.0000	0.0000	0.0000	0.1250	0.1250	0.1250

Table D.41b: Normalised Numerical Ranking of Factors (Local Weights) on Motivation Phase by DSM in LGA_C (Step 3)

		PF	TF					SF	OF
	C	MK	EF	ITI	PITK	ITS	DSP	ITS*	F
PF	MK	1	0	0	0	0	0	0	0
TF	EF	0	1	1	1/8	1/8	1	0	0
	ITI	0	1	1	1/8	1/8	1	0	0
	PITK	0	8	8	1	1	8	0	0
	ITS	0	8	8	1	1	8	0	0
	DSP	0	1	1	1/8	1/8	1	0	0
SF	ITS*	0	0	0	0	0	0	1	0
OF	F	0	0	0	0	0	0	0	1

Table D.42: Pairwise Numerical Ranking of Factors on Conception Phase by DSM in LGA_C (Step 2)

		PF	TF					SF	OF	Local Weight
	C	MK	EF	ITI	PITK	ITS	DSP	ITS*	F	
PF	MK	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
TF	EF	0.0000	0.0526	0.0526	0.0526	0.0526	0.0526	0.0000	0.0000	0.0526
	ITI	0.0000	0.0526	0.0526	0.0526	0.0526	0.0526	0.0000	0.0000	0.0526
	PITK	0.0000	0.4210	0.4210	0.4210	0.4210	0.4210	0.0000	0.0000	0.4210
	ITS	0.0000	0.4210	0.4210	0.4210	0.4210	0.4210	0.0000	0.0000	0.4210
	DSP	0.0000	0.0526	0.0526	0.0526	0.0526	0.0526	0.0000	0.0000	0.0526
SF	ITS*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
OF	F	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Table D.42b: Normalised Numerical Ranking of Factors (Local Weights) on Conception Phase by DSM in LGA_C (Step 3)

		PF			TF					SF	FF		OF		
	P	CS	CM	MK	EF	TR	ITI	PITK	ITS	ITS*	ROI	C	C*	MC	F
PF	CS	**1**	1	1/8	0	0	0	0	0	0	0	0	0	0	0
	CM	1	**1**	1/8	0	0	0	0	0	0	0	0	0	0	0
	MK	8	8	**1**	0	0	0	0	0	0	0	0	0	0	0
TF	EF	0	0	0	**1**	1	9	9	9	0	0	0	0	0	0
	TR	0	0	0	1	**1**	9	9	9	0	0	0	0	0	0
	ITI	0	0	0	1/9	1/9	**1**	8	8	0	0	0	0	0	0
	PITK	0	0	0	1/9	1/9	1/8	**1**	1	0	0	0	0	0	0
	ITS	0	0	0	1/9	1/9	1/8	1	**1**	0	0	0	0	0	0
SF	ITS*	0	0	0	0	0	0	0	0	**1**	0	0	0	0	0
FF	ROI	0	0	0	0	0	0	0	0	0	**1**	9	0	0	0
	C	0	0	0	0	0	0	0	0	0	1/9	**1**	0	0	0
OF	C*	0	0	0	0	0	0	0	0	0	0	0	**1**	1/7	1/5
	MC	0	0	0	0	0	0	0	0	0	0	0	7	**1**	7
	F	0	0	0	0	0	0	0	0	0	0	0	5	1/7	**1**

Table D.43: Pairwise Numerical Ranking of Factors on Proposal Phase by DSM in LGA_C (Step 2)

		PF			TF					SF	FF		OF			Local
	P	CS	CM	MK	EF	TR	ITI	PITK	ITS	ITS*	ROI	C	C*	MC	F	Weights
PF	CS	0.1000	0.1000	0.1000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1000
	CM	0.1000	0.1000	0.1000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1000
	MK	0.8000	0.8000	0.8000	0.4167	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.8000
TF	EF	0.0000	0.0000	0.0196	0.4285	0.4285	0.4675	0.3214	0.3214	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.3935
	TR	0.0000	0.0000	0.8235	0.4285	0.4285	0.4675	0.3214	0.3214	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.3935
	ITI	0.0000	0.0000	0.0196	0.0476	0.0476	0.0519	0.2857	0.2857	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1437
	PITK	0.0000	0.0000	0.0196	0.0476	0.0476	0.0064	0.0357	0.0357	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0346
	ITS	0.0000	0.0000	0.0000	0.0476	0.0476	0.0064	0.0357	0.0357	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0346
SF	ITS*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
FF	ROI	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.9000	0.9000	0.0000	0.0000	0.0000	0.9000
	C	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1000	0.1000	0.0000	0.0000	0.0000	0.1000
OF	C*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0769	0.1110	0.0244	0.0708
	MC	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.5385	0.7778	0.8536	0.7233
	F	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.3846	0.1110	0.1219	0.2058

Table D.43b: Normalised Numerical Ranking of Factors (Local Weights) on Proposal Phase by DSM in LGA_C (Step 3)

		PF			TF		SF		FF		OF		
	AD	PC	CS	CM	TR	DSP	TMS	HAA	ROI	C	B	B*	S
PF	PC	**1**	8	8	0	0	0	0	0	0	0	0	0
	CS	1/8	**1**	1	0	0	0	0	0	0	0	0	0
	CM	1/8	1	**1**	0	0	0	0	0	0	0	0	0
TF	TR	0	0	0	**1**	9	0	0	0	0	0	0	0
	DSP	0	0	0	1/9	**1**	0	0	0	0	0	0	0
SF	TMS	0	0	0	0	0	**1**	9	0	0	0	0	0
	HAA	0	0	0	0	0	1/9	**1**	0	0	0	0	0
FF	ROI	0	0	0	0	0	0	0	**1**	9	0	0	0
	C	0	0	0	0	0	0	0	1/9	**1**	0	0	0
FF	B	0	0	0	0	0	0	0	0	0	**1**	1	6
	B*	0	0	0	0	0	0	0	0	0	1	**1**	6
	S	0	0	0	0	0	0	0	0	0	1/6	1/6	**1**

Table D.44: Pairwise Numerical Ranking of Factors on Adoption Decision Phase by DSM in LGA_C (Step 2)

		PF			TF		SF		FF		OF			Local
	AD	PC	CS	CM	TR	DSP	TMS	HAA	ROI	C	B	B*	S	Weights
PF	PC	0.8000	0.8000	0.8000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.8000
	CS	0.1000	0.1000	0.1000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1000
	CM	0.1000	0.1000	0.1000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1000
TF	TR	0.0000	0.0000	0.0000	0.9000	0.9000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.9000
	DSP	0.0000	0.0000	0.0000	0.1000	0.1000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1000
SF	TMS	0.0000	0.0000	0.0196	0.0000	0.0000	0.9000	0.9000	0.0000	0.0000	0.0000	0.0000	0.0000	0.9000
	HAA	0.0000	0.0000	0.0196	0.0000	0.0000	0.1000	0.1000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1000
FF	ROI	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.9000	0.9000	0.0000	0.0000	0.0000	0.9000
	C	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1000	0.1000	0.0000	0.0000	0.0000	0.1000
FF	B	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4615	0.4615	0.4615	0.4615
	B*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4615	0.4615	0.4615	0.4615
	S	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0769	0.0769	0.0769	0.0769

Table D.44b: Normalised Numerical Ranking of Factors (Local Weights) on Adoption Decision Phase by DSM in LGA_C (Step 3)

		PF		TF		FF	OF		
	M	PC	CS	EF	PITK	C	B	B*	S
PF	PC	1	7	0	0	0	0	0	0
	CS	1/7	1	0	0	0	0	0	0
TF	EF	0	0	1	1/9	0	0	0	0
	PITK	0	0	9	1	0	0	0	0
FF	C	0	0	0	0	1	0	0	0
OF	B	0	0	0	0	0	1	1/8	6
	B*	0	0	0	0	0	8	1	8
	S	0	0	0	0	0	1/6	1/8	1

Table D.45: Pairwise Numerical Ranking of Factors on Motivation Phase by PSD in LGA_C (Step 2)

		PF		TF		FF	OF			Local
	M	PC	CS	EF	PITK	C	B	B*	S	Weights
PF	PC	0.8750	0.8750	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.8750
	CS	0.1250	0.1250	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1250
TF	EF	0.0000	0.0000	0.1000	0.1000	0.0000	0.0000	0.0000	0.0000	0.1000
	PITK	0.0000	0.0000	0.9000	0.9000	0.0000	0.0000	0.0000	0.0000	0.9000
FF	C	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
OF	B	0.0000	0.0000	0.0000	0.0000	0.0000	0.1091	0.1000	0.4000	0.2030
	B*	0.0000	0.0000	0.0000	0.0000	0.0000	0.8727	0.8000	0.5333	0.7353
	S	0.0000	0.0000	0.0000	0.0000	0.0000	0.0182	0.1000	0.0667	0.0616

Table D.45b: Normalised Numerical Ranking of Factors (Local Weights) on Motivation Phase by PSD in LGA_C (Step 3)

		PF	TF					SF	OF	
	C	MK	EF	ITI	PITK	ITS	DSP	ITS*	B*	F
PF	MK	1	0	0	0	0	0	0	0	0
TF	EF	0	1	5	1/8	1/9	1	0	0	0
	ITI	0	1/5	1	1/8	1/9	1/5	0	0	0
	PITK	0	8	8	1	1/9	8	0	0	0
	ITS	0	9	9	9	1	9	0	0	0
	DSP	0	1	5	1/8	1/9	1	0	0	0
SF	ITS*	0	0	0	0	0	0	1	0	0
OF	B*	0	0	0	0	0	0	0	1	8
	F	0	0	0	0	0	0	0	1/8	1

Table D.46: Pairwise Numerical Ranking of Factors on Conception Phase by PSD in LGA_C (Step 2)

		PF	TF					SF	OF		Local
	C	MK	EF	ITI	PITK	ITS	DSP	ITS*	B*	F	Weights
PF	MK	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
TF	EF	0.0000	0.0521	0.1785	0.0121	0.0769	0.0521	0.0000	0.0000	0.0000	0.0743
	ITI	0.0000	0.0104	0.0357	0.0121	0.0769	0.0104	0.0000	0.0000	0.0000	0.0291
	PITK	0.0000	0.4167	0.2857	0.0964	0.0769	0.4167	0.0000	0.0000	0.0000	0.2585
	ITS	0.0000	0.4687	0.3214	0.8674	0.6923	0.4687	0.0000	0.0000	0.0000	0.5637
	DSP	0.0000	0.0521	0.1785	0.0121	0.0769	0.0521	0.0000	0.0000	0.0000	0.0743
SF	ITS*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
OF	B*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.8890	0.8890	0.8890
	F	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1111	0.1111	0.1111

Table D.46b: Normalised Numerical Ranking of Factors (Local Weights) on Conception Phase by PSD in LGA_C (Step 3)

		PF			TF					SF		FF		OF				
	P	PC	CS	CM	EF	TR	ITI	PITK	ITS	TMS	ITS*	ROI	C	C*	MC	B	B*	F
PF	PC	1	9	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	CS	1/9	1	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	CM	1/9	1/7	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TF	EF	0	0	0	1	9	9	9	9	0	0	0	0	0	0	0	0	0
	TR	0	0	0	1/9	1	8	8	8	0	0	0	0	0	0	0	0	0
	ITI	0	0	0	1/9	1/8	1	7	7	0	0	0	0	0	0	0	0	0
	PITK	0	0	0	1/9	1/8	1/7	1	5	0	0	0	0	0	0	0	0	0
	ITS	0	0	0	1/9	1/8	1/7	1/5	1	0	0	0	0	0	0	0	0	0
SF	TMS	0	0	0	0	0	0	0	0	1	9	0	0	0	0	0	0	0
	ITS*	0	0	0	0	0	0	0	0	1/9	1	0	0	0	0	0	0	0
FF	ROI	0	0	0	0	0	0	0	0	0	0	1	9	0	0	0	0	0
	C	0	0	0	0	0	0	0	0	0	0	1/9	1	0	0	0	0	0
OF	C*	0	0	0	0	0	0	0	0	0	0	0	0	1	1/8	1/6	1/6	1/7
	MC	0	0	0	0	0	0	0	0	0	0	0	0	8	1	8	8	8
	B	0	0	0	0	0	0	0	0	0	0	0	0	6	1/8	1	1	1/7
	B*	0	0	0	0	0	0	0	0	0	0	0	0	6	1/8	1	1	1/7
	F	0	0	0	0	0	0	0	0	0	0	0	0	7	1/8	7	7	1

Table D.47: Pairwise Numerical Ranking of Factors on Proposal Phase by PSD in LGA_C (Step 2)

		PF			TF					SF		FF		OF					Local Weight
	P	PC	CS	CM	EF	TR	ITI	PITK	ITS	TMS	ITS*	ROI	C	C*	MC	B	B*	F	
PF	PC	0.8182	0.8873	0.5294	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.7449
	CS	0.0909	0.0986	0.4118	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2004
	CM	0.0909	0.0142	0.0588	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0546
TF	EF	0.0000	0.0000	0.0000	0.6923	0.8675	0.4922	0.3571	0.3000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.5418
	TR	0.0000	0.0000	0.0000	0.0769	0.0964	0.4375	0.3174	0.2667	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2389
	ITI	0.0000	0.0000	0.0000	0.0769	0.0120	0.0547	0.2778	0.2333	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1309
	PITK	0.0000	0.0000	0.0000	0.0769	0.0120	0.0078	0.0397	0.1667	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0606
	ITS	0.0000	0.0000	0.0000	0.0769	0.0120	0.0078	0.0079	0.0333	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0276
SF	TMS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.9000	0.9000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.9000
	ITS*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1000	0.1000	0.1000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1000
FF	ROI	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.9000	0.9000	0.9000	0.0000	0.0000	0.0000	0.0000	0.0000	0.9000
	C	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1000	0.1000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1000
OF	C*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0357	0.0833	0.0097	0.0097	0.0151	0.0307
	MC	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2857	0.6667	0.4460	0.4460	0.8485	0.5385
	B	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2143	0.0833	0.0582	0.0582	0.0151	0.0858
	B*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2143	0.0833	0.0582	0.0582	0.0151	0.0858
	F	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.0833	0.4077	0.4077	0.1060	0.2594

Table D.47b: Normalised Numerical Ranking of Factors (Local Weights) on Proposal Phase by PSD in LGA_C (Step 3)

		PF			TF		SF			FF		OF			
	AD	PC	CS	CM	TR	DSP	TMS	ITS*	HAA	ROI	C	C*	B	B*	S
PF	PC	1	8	8	0	0	0	0	0	0	0	0	0	0	0
	CS	1/8	1	1	0	0	0	0	0	0	0	0	0	0	0
	CM	1/8	1	1	0	0	0	0	0	0	0	0	0	0	0
TF	TR	0	0	0	1	1	0	0	0	0	0	0	0	0	0
	DSP	0	0	0	1	1	0	0	0	0	0	0	0	0	0
SF	TMS	0	0	0	0	0	1	9	9	0	0	0	0	0	0
	ITS*	0	0	0	0	0	1/9	1	6	0	0	0	0	0	0
	HAA	0	0	0	0	0	1/9	1/6	1	0	0	0	0	0	0
FF	ROI	0	0	0	0	0	0	0	0	1	9	0	0	0	0
	C	0	0	0	0	0	0	0	0	1/9	1	0	0	0	0
FF	C*	0	0	0	0	0	0	0	0	0	0	1	1/6	1/6	4
	B	0	0	0	0	0	0	0	0	0	0	6	1	1	6
	B*	0	0	0	0	0	0	0	0	0	0	6	1	1	6
	S	0	0	0	0	0	0	0	0	0	0	1/4	1/6	1/6	1

Table D.48: Pairwise Numerical Ranking of Factors on Adoption Decision Phase by PSD in LGA_C (Step 2)

		PF			TF		SF			FF		OF				Local
	AD	PC	CS	CM	TR	DSP	TMS	ITS*	HAA	ROI	C	C*	B	B*	S	**Weights**
PF	PC	0.8000	0.8000	0.8000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.8000
	CS	0.1000	0.1000	0.1000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1000
	CM	0.1000	0.1000	0.1000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1000
TF	TR	0.0000	0.0000	0.0000	0.5000	0.5000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.5000
	DSP	0.0000	0.0000	0.0000	0.5000	0.5000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.5000
SF	TMS	0.0000	0.0000	0.0000	0.0000	0.0000	0.8182	0.8852	0.5625	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.7553
	ITS*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0909	0.0984	0.3750	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1881
	HAA	0.0000	0.0000	0.0000	0.0000	0.0000	0.0909	0.0164	0.0625	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0566
FF	ROI	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.9000	0.9000	0.0000	0.0000	0.0000	0.0000	0.9000
	C	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1000	0.1000	0.0000	0.0000	0.0000	0.0000	0.1000
FF	C*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0755	0.0714	0.0714	0.2353	0.1134
	B	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4528	0.4285	0.4285	0.3529	0.4157
	B*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4528	0.4285	0.4285	0.3529	0.4157
	S	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0188	0.0714	0.0714	0.0588	0.0551

Table D.48b: Normalised Numerical Ranking of Factors (Local Weights) on Adoption Decision Phase by PSD in LGA_C (Step 3)