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# EXTENDING IT INFRASTRUCTURES IN THE LOCAL GOVERNMENT AUTHORITIES THROUGH ENTERPRISE APPLICATION INTEGRATION

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## Abstract

Local Government Authorities (LGAs) serve as agents to provide better and reliable services and information to their citizens. However, literature indicates that LGAs have problems in meeting citizens' demands. This may be attributed to the Information Technology (IT) infrastructure limitations in LGAs that are not integrated and do not allow them to deliver end-to-end integrated services. This paper examines a potentially important area of IT infrastructure integration in LGAs through Enterprise Application Integration (EAI). It has emerged to support organisations to integrate their IT infrastructures and deliver high quality of services. Despite the fact that several organisations in the private and public domain 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. For this reason, LGAs need to realise the importance of EAI and speed up their decision-making process to adopt it. As a result, further research is required to support the decision-making process in LGAs when taking decisions for EAI adoption. Thus, the authors demonstrate that it is of high importance to investigate this area within LGAs and result in research that contributes towards successful EAI adoption. In doing so, allowing others to relate their experiences to those reported herein as well as to aid other LGAs on how they can integrate their disparate systems more efficiently and extend their IT infrastructures.

## Keywords

EAI, LGAs, Adoption, IT Infrastructure, Limitations.

## INTRODUCTION

In the last decades, LGAs have adopted several Information Systems (IS) to: (a) support their business processes, (b) meet citizens' needs including housing, social services, and the management of a complex service infrastructure that supports communities and businesses and (c) increase their productivity (Johnson and King, 2005). However, the lack of common enterprise-wide IT infrastructure has resulted in the development of a diversity of disparate applications (Lam, 2005; Beaumaster, 2002). The disadvantages of such heterogeneous IT infrastructures are analysed in the literature (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 integration (Wimmer, 2002). Nevertheless, 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). Moreover, 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). Most of these IS were based on the latest technological advances and thus, implemented on different platforms, using various technologies and standards (Janssen and Cresswell, 2005; Di Natale *et al.*, 2003). 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 display differences in the way: (a) their business processes are implemented to provide citizen services, and (b) they make their decisions that differs a lot from other private organisations (Johnson and King 2005). These theorised evidences illustrate that LGAs operate and function independently and do not share information and functionality with other LGAs (Gortmaker and Janssen 2004).

During the recent years, EAI has emerged to support organisations to integrate their IT infrastructures and deliver high quality of services. EAI can be used to piece together LGA IS with packaged and legacy systems (Kamal and Themistocleous, 2007; 2006). Despite many other types of organisations e.g. healthcare and private organisations have adopted EAI, its application by LGAs is limited. For this reason, LGAs need to realise the importance of EAI and speed up their decision-making process to adopt it. Thus, further research is required to support the decision-making process in LGAs for EAI adoption. Although existing EAI adoption models e.g. Mantzana (2006), Khoumbati (2005), Chen (2005) and Themistocleous (2004) have been reported, the applicability and validity of these models in the public domain is arguable and under research, as these models were proposed to support the decision-making process in other sector organisations and not in LGAs. The reason is that 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 the size (e.g. one set of factors is used to support EAI adoption in SMEs and other in large organisations). Similarly, there are differences among factors that are used in healthcare, multinational, SMEs and large organisations. Due to this reason, these factors may not be applicable in LGAs.

Thus, in doing so, Kamal and Themistocleous (2007; 2006) proposed an EAI adoption model in the area of LGAs in their previous research. The model presents several factors influencing EAI adoption in LGAs e.g. project champion, citizen's satisfaction, critical mass, market knowledge, top management support. These factors can be used to understand EAI adoption for improving IT infrastructures in LGAs. Themistocleous *et al.*, (2005) reports that there is an increasing demand to integrate the IT infrastructures in LGAs. This demand comes from unlike categories of stakeholders in LGAs like employees, citizens, and businesses. All of them seek to ease their transactions with other LGAs. Thus, 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 IS, and (e) persistent business process transformation. In doing so, the authors attempt to examine an EAI based case study in an LGA (coded as LGA\_EAST\_LONDON). The authors assert that this case study may assist other LGAs in building an understanding before EAI adoption to resolve their organisational and integration problems. In the subsequent section, the authors highlight the IT infrastructure limitations in LGAs and exemplifying the need for integration in the local government authorities. Thereafter, discussing on EAI and research methodology adopted to conduct the case study. Then the authors discuss in detail on the case organisation and the integration project conducted in the case organisation and summarising the conclusions in the end.

## THE IT INFRASTRUCTURE LIMITATIONS IN LGAs

Literature indicates several IT infrastructure limitations in the LGAs explained as below.

### Enterprise Resource Planning (ERP) 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 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 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 leading to failure (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). As Dawes (1996) points out, it offers organisations a greater capacity to share information and make better-informed decisions based on more complete and integrated data. Gil-García *et al.*, (2005) also reports that it allows managers to work at the same time, with the same information drawn from multiple disparate sources. To access seamless information, the standalone IS need to be integrated to enhance seamless interoperability (Wimmer and Traunmüller, 2002). Yet, the extent of information sharing and IS integration in LGAs has been limited and in many 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 needs (Di Natale *et al.*, 2003). This may induce LGAs in adopting EAI 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 addresses and (b) benefits. Access to such information must be controlled as disclosure to irrelevant users may cause problems for citizens' privacy. The government departments need to provide technical solutions and transparency of procedures. To date several privacy-augmenting technologies exist including among others: Anonymizer (Osorio, 2001), Crowds (Reiter and Rubin, 1998) etc. 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 electronic Government (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 these 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 has been fully utilised, the next developmental step leads to the integration of services and business processes within and across government organisations and departments (Layne and Lee, 2001). Thus, better service provision requires the integration of business processes across multiple LGAs. For business process integration, 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. Customer Relationship Management (CRM) systems, Geographic Information Systems (GIS) etc 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 information systems 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 Traummüller, 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 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, integration is needed to increase the performance and efficiency of LGAs, which results in improvements of financial capacity (Janssen and Cresswell, 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 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), (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 (e.g. 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 (e.g. applications can not communicate and exchange data due to their nature), (d) interdepartmental coordination (Beaumaster, 2002) (e.g. coordination has been a continuing problem for the LGAs in implementing and using IT thus, affecting the success of LGA initiatives), or (e) uniqueness of integration needs (Adams *et al.*, 2003). LGAs may also have different business processes that require discrete information transformations and process control structures. Often, application may be developed at different times by different group of experts that operate independently and do not consider the interoperability constraints. Thus, LGAs need to integrate their financial, human resource, customer support and other disparate systems to support management and enhance decision-making process.

### **IT INFRASTRUCTURES IN LGAs - NEED FOR INTEGRATION**

Literature indicates that LGAs need a technological solution to overcome their IT infrastructure limitations. Elmagarmid and McIver, (2001) 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 and due to this many problems such as data integration or security interoperability that are technical in nature, remain most apparent at developmental and functional levels (Heeks, 1999). Nonetheless, several other efforts have been made to achieve integration at various levels of the government in the last decades e.g. projects such as: (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), SINET (Corbett and Noyes, 2004). 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 LGAs, PASSPORT developed for Greek local government etc. 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 (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 (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 discussed in the earlier

sections; indicate the need for the adoption of enterprise application integration in LGAs. Since EAI is a new research area within the local government authorities, an attempt to review the literature on EAI adoption indicates gap in the normative literature. To provide a philosophical understanding on EAI and its importance in the local government authorities, the following section reviews the normative literature on EAI.

## **ENTERPRISE APPLICATION INTEGRATION**

Enterprise application integration has emerged to overcome integration problems at all levels (e.g. data, object and process). EAI evolved to overcome the limitations of ERP and other packaged and legacy systems through providing an integrated organisational infrastructure (Janssen and Cresswell, 2005). 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). EAI also allows the organisations to simplify interactions among organisation applications by adopting a standard approach to integration, replacing hundreds or thousands of ad hoc integration designs (Lam, 2005). Organisations that have integrated their IT infrastructures through EAI have reported significant benefits (Bass and Lee, 2002). For example, it 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 (Themistocleous and Irani, 2001). 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). 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). 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). When such leveraging and presentation occurs, LGAs may capitalise on their opportunities offered by LGA initiatives because then they may efficiently interact with their citizens and other stakeholders on a consistent basis (Janssen and Cresswell, 2005). However, EAI adoption has not been widely investigated in LGAs, thus research around it remains limited. 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 (Kamal and Themistocleous, 2007; 2006) and (c) lack of understanding and knowledge on EAI in LGAs (Kamal, 2004). Thus, LGAs seek answers for the effect of EAI adoption, as it will assist them in understanding EAI technological benefits, barriers and costs.

## **RESEARCH METHODOLOGY**

The role and the applicability of EAI in developing integrated IT infrastructures remains under investigation within LGAs. This paper attempts to study EAI to understand how public organisations use EAI technology to develop integrated IT infrastructures. The authors have followed an interpretive, qualitative case study approach to conduct this research. Interpretivism stance was adopted, as the aim of this paper is to understand how LGAs integrate their IT infrastructures. An interpretivism stance allows the authors to navigate and better explain this phenomenon. Also, the authors suggest that in the context of this research a qualitative approach is more appropriate as such approach can be used to: (a) investigate little-known phenomena like EAI, (b) examine EAI adoption factors (Kamal and Themistocleous, 2007, 2006), (c) examine the phenomenon in its natural setting and, (d) learn from practice. In addition, the authors used a case study strategy to explore and understand the development of IT infrastructures in LGAs. In doing so, various data collection methods such as interviews, documentation, and observation were used. The bias that is considered to be a danger in using qualitative research approach is overcome by data triangulation. The use of multiple data collection methods makes the triangulation possible, which provides stronger substantiation of theory (Eisenhardt, 1989). For the purpose of this paper, three types of triangulation are used namely: (a) data (b) methodological and, (c) interdisciplinary triangulation.

## **CASE ORGANISATION – LGA\_EAST\_LONDON**

### **Background to LGA\_EAST\_LONDON**

Situated in the east – LGA\_EAST\_LONDON (hereafter also referred as borough), this London borough has a 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 most ethnically diverse local government authority, as about half the population in the borough belongs to ethnic minority groups. LGA\_EAST\_LONDON is responsible for providing public services and political leadership. It employs more than 5000 employees and provides its services through various sectors including among others benefits and customer services, children and young people's services, housing and public protection,

property, education, health etc. These sectors receive approximately 1000-1500 citizen queries via telephone, whereas, face-to-face contacts are approximately less than 1000 on daily basis.

### **Background Of LGA\_EAST\_LONDON IT Infrastructure**

LGA\_EAST\_LONDON 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, the borough faced funding pressures and challenges in terms of improved resource and asset management. LGA\_EAST\_LONDON 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 interviewees i.e. Head of IT (HIT), Project Manager (PM), Development Service Manager (DSM), Principle Systems Developer (PSD), Senior Development Engineer (SDSE) and Service Delivery Manager (SDM), mutually agreed that: “... in late 1990’s and early 2000 their IT infrastructure 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”.

The delivery of services to its community is the responsibility of this borough. Like other LGAs, this borough is working to make its services more citizen-centric and more accessible. Nevertheless, borough’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 would enable it to meet its targets for modernisation and e-Government much more readily and contributing to improved efficiency. LGA\_EAST\_LONDON began to search for partners to help them implement integrated IT infrastructure. Due to the scope of different projects conducted were so extensive, 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. The borough collaborated with several partners for the design, configuration, implementation and upgrading of a complete IT infrastructure. However, the borough faced several challenges in integrating their IT infrastructures in different departments. Figure 1 illustrates a recent global point-to-point IT infrastructure as provided by the interviewees. Interviewees also reported that there were several limitations to the point-to-point IT infrastructure. Due to the limitations in point-to-point integration, the borough faced several problems. The limitations along with the problems are explained (with comments from the interviewees) in subsequent section.

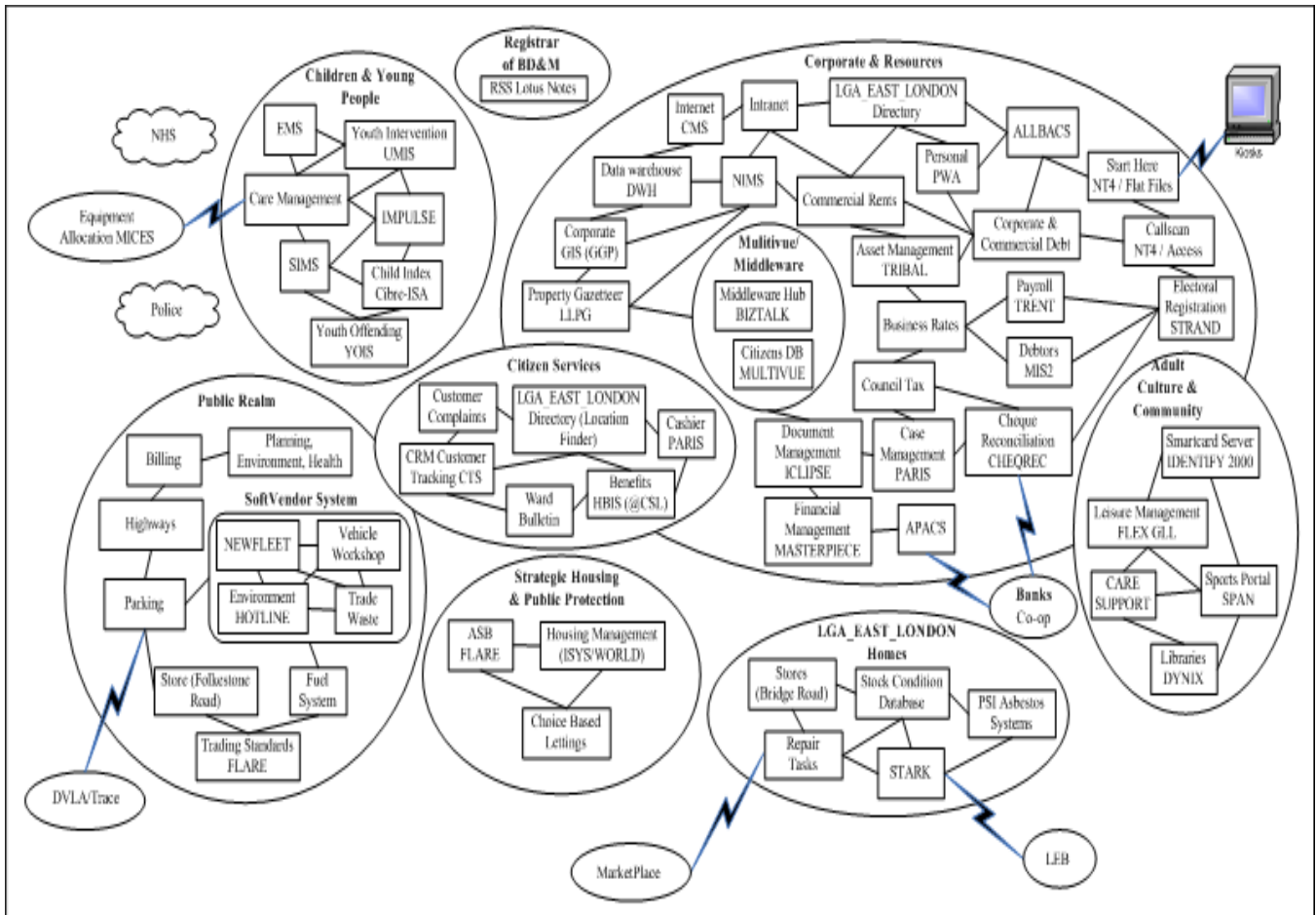


Figure 1: LGA\_EAST\_LONDON Global Point-to-Point IT Infrastructure

**Limitations in Integrating IT Infrastructure**

LGA\_EAST\_LONDON implemented various IS to enhance their service delivery. These IS did not solve all the problems. Thus, 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. The authors present the limitations that were highlighted: (a) during the interviews, (b) from documentation and (c) self observations during interviews.

IT infrastructure from late 1990’s to early 2000 was very diverse and consisted several incompatible systems. As a result, LGA\_EAST\_LONDON faced integration problems when attempting to migrate their existing custom built applications to other ERP systems. The interviewee reported 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 the borough), as many applications store similar data or run systems that overlap in functionality. The interviewee 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.” Thus, the interviews illustrates that ERP systems did not benefit the borough in solving their integration problems. The interviews conducted with all the interviewees illustrate that information sharing and IS integration was a problem, as all 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.”



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, all 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 interviewees said that: "... it is difficult to trust the staff members on the citizen's data confidentiality." While discussing BPR in e-Government projects, one of the interviewee replied that: *"The biggest challenge LGA\_EAST\_LONDON 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 authors observation from the interviews conducted is that the borough 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 authors also observed during the discussions that if the boroughs' IT infrastructure cannot efficiently support core business processes then this may be an obstacle in achieving their business goals. Therefore, it is necessary for the borough BPR so as to take advantage of EAI technology.

The interview discussions on front-office/back-office operations and functioning with the interviewees reveals 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. LGA\_EAST\_LONDON 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 with one of the interviewee, reported that: *"LGA\_EAST\_LONDON 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."* Another interviewee furthermore added that: *"It is sometimes easy to integrate processes without integrating the systems. So when you talk about EAI, then sometimes it is 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, borough'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 borough and the citizens.

The IT infrastructure limitations 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. 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\_EAST\_LONDON IT infrastructure. There was also a strong need to integrate legacy systems to improve coordination and relationships with suppliers and citizens. Clearly, the findings on the background to LGA\_EAST\_LONDON IT infrastructure indicate that there was a negative impact on the delivery of services to citizens. The limitations discussed above are relatively similar and can be correlated with the IT infrastructure limitations presented earlier as a result of literature review. The results motivated the LGA\_EAST\_LONDON to take the decision for EAI adoption for developing integrated IT infrastructure.

### **Motivations for EAI Adoption**

The IT infrastructure limitations led the borough to take a decision to significantly advance in service delivery by adopting EAI solution to develop an integrated IT infrastructure. One interviewee 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."* EAI adoption has played a vital part in continuing improvements in the borough. LGA\_EAST\_LONDON have since completed organisational restructuring to become "one borough" and embarked upon a corporate programme of business improvement that involves end-to-end process management and organisation around outcomes. LGA\_EAST\_LONDON comprehensive IT infrastructure has enabled the re-launch of web presence to provide much more than a front-end and enable complete engagement with the transformational government programme. A major development in the borough has been the London Portal.

LGA\_EAST\_LONDON is a keen supporter of the emerging focus on the “e” representing efficient and effective Government, and integration of IT continues to play a crucial role in the borough’s corporate business efficiency/improvement programme. LGA\_EAST\_LONDON believes that pervasive standards-based infrastructure is essential to support effective intra-governmental working. LGA\_EAST\_LONDON’s IT service is the first public body in the world to be accredited to the BS 15000 standard based upon the IT infrastructure library. In interpreting from the empirical data, it appears that internal pressure (e.g. top management to improve IT infrastructure) and external pressure (e.g. central government to improve service delivery) influence EAI adoption at LGA\_EAST\_LONDON.

### **EAI Adoption Process**

LGA\_EAST\_LONDON yet still has a host of legacy systems such as citizen’s care management, housing, revenues and benefits and other business applications that manually linked with each other point-to-point connections. These systems were efficient in supporting departmental functions, but were not seamlessly integrated. Thus, the borough was also 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 contained in them and to make development more manageable, the second option was chosen. The overall 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. Thus, the project team decided to utilise a message based integration technology i.e. XML/web services for this project. Discussing on the EAI adoption process and what the reasons were for selecting EAI based message based technologies and not any other solution; an interviewee reported that: “...we wanted to use the technologies we already had and had expertise and skills in. So basically we did not wanted to go and procure another solution that may have cost us lots of money. In addition, for this project we needed a solution that could assist us in implementing the project quickly.”

### **EAI ADOPTION IN LGA\_EAST\_LONDON – SOFTVENDOR AND CRM SYSTEM 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**

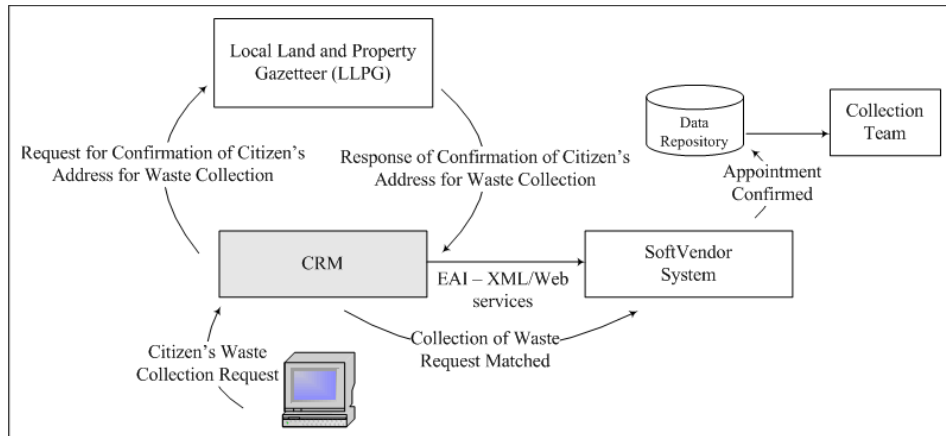
This borough has used the latest technology to launch an appointment based, free service to collect large or bulky household waste from domestic properties. For this project, the borough collaborated with SoftVendor to introduce a waste management system that has been integrated with the in house CRM 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 (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 authority 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**

LGA\_EAST\_LONDON decided to follow a gradual augmentation approach towards integration of SoftVendor and CRM system i.e. an incremental approach for incrementing a service at a time until all the services are implemented.

#### **The Solution**

The staff members in the borough's corporate contact centre and local service centres record and allocate collection requests from local residents. Collection addresses are compared against the borough's Local Land Property Gazetteer (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 2 illustrates the project.



**Figure 2: 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 borough provides to their residents, it also reduces the administrative burden, increases operating efficiencies and enables effective targeting of sometimes limited resources. Borough 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. Borough, 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. The interviewees reported that in the first three months the borough has logged approximately 13,000 jobs using the integrated system. Also by comparing the pre SoftVendor business processes with the post integration processes, the borough estimates an improvement in business processes across all service areas over the next 12 months. For other areas, the borough is gradually moving towards an EAI hub and spoke methodology to develop a global integrated IT infrastructure. The integration of SoftVendor and CRM system project is one of the completed projects within the global EAI IT infrastructure, LGA\_EAST\_LONDON is moving towards.

### Findings on the SoftVendor and CRM System 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, the borough wanted to implement this project quickly using in-house skills and expertise. So for this purpose senior management was involved while discussing on the integration of SoftVendor system and CRM system project. The final decision for selecting EAI solution (i.e. XML/web services) for the project was made by the head of IT (centralisation) who was also actively but indirectly involved in this project. However, the project team was to some extent reluctant in selecting EAI because the team was presupposing that selecting EAI may have some risks e.g. EAI may not be able to deliver the benefits, EAI solution may not work, EAI cost etc. Thus, eventually the project team decided to opt for XML/web service for integrating SoftVendor and CRM system. The interview discussions also illustrate that the project team did not use any external consultant expertise, instead relied on the expertise of their in-house staff members involved in the project. An interviewee reported the reasons for not selecting external consultant expertise that: "... it was

quite obvious why we wanted to do the integration in-house as 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 authors discussed on few factors that influenced EAI adoption in LGA\_EAST\_LONDON. In addition, there were several other factors (Kamal and Themistocleous, 2007; 2006) 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 during this project i.e. reliable data, quicker response to change, increase in performance, organised business processes etc. The efforts to improve the IT infrastructure at LGA\_EAST\_LONDON by adopting EAI solution resulted in the facing several barriers e.g. silo mentality and ownership of cleaning the data etc.

Integration Approach and Project Implementation

The authors suggest that the low level of IT infrastructure in LGA\_EAST\_LONDON influenced the project team to adopt an integration solution that can assist the department in quickly implementing the project. The discussions with the interviewees revealed that, there was pressure 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.

LGA\_EAST\_LONDON – Testing EAI Adoption Factors

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 1 provides with the analysis of the factors using Miles and Huberman (1994) scale of less important (○), medium important (◉) and most important (●).

	EAI Adoption Factors	HIT	PM	DSM	PSD	SDM	SDE
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	ROI	●	◉	◉	●	●	●
	Cost	●	●	●	●	●	●
Organisational Factors	Centralisation	◉	●	◉	◉	●	●
	Managerial Capability	●	●	●	●	●	●
	Barriers	●	●	●	●	●	●
	Benefits	●	●	●	●	●	●
	Formalisation	◉	◉	●	◉	●	●
	Size	●	◉	◉	◉	◉	●

Table 1: Validation of Factors Influencing EAI Adoption in LGA\_EAST\_LONDON

Table 1 illustrates mixed results on the importance of factors influencing EAI adoption in LGA\_EAST\_LONDON. All the interviewees mutually agreed that (a) project champion, (b) data security and privacy (c) top management support, (d) managerial capability, (e) benefits and (f) barriers as most important factors that influenced their decision for adopting EAI based solutions. Other factors had mixed views from the interviewees and this can be attributed to the role, responsibility and involvement of each interviewee in the SoftVendor and CRM system integration project. However, with the

conformity of these factors with moderate and high importance, the authors assert that the EAI adoption factors are validated through the SoftVendor and CRM systems integration project.

## CONCLUSIONS

While private organisations have continued to take advantage of the IT to improve their business processes, services offered by government organisations have remained deficient over the years. The concept of e-Government has emerged as a credible solution to improve such services as it allows people to access public services from within their own homes or offices. The importance of e-Government has been widely recognised with 30 European ministers agreed upon a plan to speed up the development of e-Government applications in an attempt to modernise the European public sector. During the last years local government authorities have adopted CRM applications to improve their services and the relationships with their citizens. The application of CRM is beneficial for LGAs as it results in improvements in information sharing and cost reduction. Recently, many LGAs have attempted to link together their e-Government and CRM applications to gain more advantages and deliver better services. Nonetheless, LGAs have realised that they can gain significant advantages when they integrate their CRM and e-Government systems with their disparate back office solutions. Thus, there are seeking ways to integrate their applications and IT infrastructures. The authors suggest that LGAs can focus on integration technologies like EAI to incorporate their systems and processes, and thus, achieving their goals. Yet, the adoption of EAI by LGAs is still in its infancy with LGAs, researchers need to understand the issues surrounding this technology. In this paper the authors present and analyse a case study that focuses on the development of integrated IT infrastructures in LGA\_EAST\_LONDON. Thus, the borough collaborated to piece together its CRM with SoftVendor system. The results may seem less as they are based on one case study, however it will allow other researchers to take it as a starting point in comparing and better analysing EAI adoption factors when analysing more case studies within LGAs. The authors asserts that as the number of cases will increase it will provide more harmonised results, allowing better analysis and decision-making for EAI adoption.

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