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Emerging Issues Of Enterprise Architecture In UK Universities

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EMERGING ISSUES OF ENTERPRISE ARCHITECTURE IN UK UNIVERSITIES

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Abstract

"New paradigms have emerged in Information Systems discipline that leverages the value of Information Technology planning and management. Corporate governments adopt Enterprise Architecture (EA), as a strategy for aligning business goals and information systems strategy so IT resources may become effective. IT management and future investments are challenging for many institutions due to the devolved nature of the institution. IT resources need to be effectively coordinated. The UK HE sector is currently faced with such challenge. Higher educational institutions are adopting modern approaches in addressing fundamental changes that include constrained funds, and improving students and stakeholder demand. EA helps an organisation manage its IT resources by aligning the IT strategy with the business strategy, so that IT becomes a worthy investment. This study will determine the current approach towards EA and its interpretation as an IS planning practice in UK higher institutions. This paper reviews current literature and uses qualitative methods to analyse the data collected. Data used for this study include transcripts from interviews, data from workshops cum focus groups, and reports from five institutions in the Joint Information Systems Committee (JISC), funded pilot study. The results from this qualitative analysis show that EA represents a new IT management innovation in the HE sector that would help senior management decision making, help departments share reusable resources and ensure IS departments become more successful by looking at how IS impacts on an organisation's strategy. The paper concludes with identification of key issues emerging in the adoption of this approach in the context."

Keywords: IS planning, IT management, Enterprise Architecture, Adoption

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Abstract

"New paradigms have emerged in Information Systems discipline that leverages the value of Information Technology planning and management. Corporate governments adopt Enterprise Architecture (EA), as a strategy for aligning business goals and information systems strategy so IT resources may become effective. IT management and future investments are challenging for many institutions due to the devolved nature of the institution. IT resources need to be effectively coordinated. The UK HE sector is currently faced with such challenge. Higher educational institutions are adopting modern approaches in addressing fundamental changes that include constrained funds, and improving students and stakeholder demand. EA helps an organisation manage its IT resources by aligning the IT strategy with the business strategy, so that IT becomes a worthy investment. This study will determine the current approach towards EA and its interpretation as an IS planning practice in UK higher institutions. This paper reviews current literature and uses qualitative methods to analyse the data collected. Data used for this study include transcripts from interviews, data from workshops cum focus groups, and reports from five institutions in the Joint Information Systems Committee (JISC), funded pilot study. The results from this qualitative analysis show that EA represents a new IT management innovation in the HE sector that would help senior management decision making, help departments share reusable resources and ensure IS departments become more successful by looking at how IS impacts on an organisation's strategy. The paper concludes with identification of key issues emerging in the adoption of this approach in the context."

1.0 Introduction

EA as a relatively young and maturing aspect of the Information Systems (IS) discipline is widely adopted across private and public sectors (Schekkerman, 2004; Ekstedt, 2004; Hirvonen, 2005; Peristeras, 2006; Hjort-Madsen & Burkard, 2006; Rickards, 2007; Janssen & Hjort-Madesn, 2007; FEAF, 2007; Pulkkinen; 2008). In 2004, Lagenberg and Wegmann described EA as an 'immature discipline' (Lagenberg and Wegmann, 2004) and a larger majority of business managers propose it is a growing and 'aspiring discipline.' The most recent large-scale adoption of EA is identified in the public sector by the Danish, Australian and American national government agencies in research studies conducted (Janssen & Hjort-Madesn, 2007; Hjort-Madesn, 2009). National EA programmes were launched following the requirements of new government regulations that government agencies consider architectural approaches to IS planning and administrative transformation.

In 2008, the Joint Information Systems Committee (JISC) launched EA pilot study in UK universities as part of an e-framework and 'shared services' initiatives (JISC Techwatch Report, 2009). The initiative proposed that institutions needed to use modern approach, such as EA ideas, principles and standards in the HE environment to

provide professional IT services. This would be a way forward for the sector's IT development. Hence, the pilot EA study was created in the HE sector to create the effective conditions for strategic business and IT decision making. Higher institutions use information systems extensively to provide educational support to students, teaching, learning, research and for administrative tasks. In the HE sector, technologies existed in silos and are largely influenced by ad hoc decision making. The objective of this study is to review the adoption practice of Enterprise Architecture (EA) in UK higher educational institutions and identify the emerging issues in comparison to issues that emerge in other EA adoption.

2.0 Research Motivation

The new interest in enterprise modelling in the HE sector brought interest both for EA practitioners and the academic environment. This type of study is characterised as noteworthy and dynamic because it contributes to the body of knowledge of EA proponents and academicians. The reason given is that higher institutions have a unique structure and age-long culture for successful adoption of EA concepts. The typical environment for HEIs is distinguished by disparate demands from regulatory bodies, industry partners, students and internal staff needs, and constrained resources (JISC TechWatch, 2009). As a public sector, HEIs operational tactics revolve around many IT management and units within an institution that technically impede the ability to integrate or consolidate them all into a central operational unit. This lack of central management breeds both interoperability and communication technicalities and drives slim the chances for reuse of data and system functionalities. Though, the idea of EA seems to float through the business strategic unit, there has been no formalisation of the technique. There are several indications of some work of EA being conducted and ad hoc architectures produced; it lacks a more structured approach to process improvement within the organisation. The EA technique may provide HEIs with structures, and abstractions that would capture the entire business and IT scenario that may be used as a tool for better decision-making. When decisions are taken, the management and stakeholders are able to understand the impact of such decisions. Few diffusion researches have been conducted in the area of assessing motivations for innovation adoption (Rogers, 1995). The study would capture individual perceptions of EA adoption within the higher institutions. This study seeks

to contribute to the body of knowledge in the academic field. Organisational issues within the context often involve major changes to internal business patterns and structures. HEIs are also involved in the cross selling and co-branding of services and products to clients and these involve collaboration with third parties, businesses and other institutions. The ability to improve on quality service and product more quickly is vital to preserve these relationships (JISC TechWatch, 2009). System developments are conducted in obscured visibility to the whole - the enterprise, hence, the lack of functionalities, i.e., systems integration within the larger organisation. The following selected points have been identified as common technicalities faced by many universities. They include:

- Lack of single view of institutional assets, coherent information of business processes, services provided, applications and underlying technologies;
- Lack of common understanding and governance of key data resources;
- Need for diversity and coherent governance structures;
- Too many legacy applications and infrastructures that eventually lead to complexities and inefficiencies;
- Duplicated purposes in technology functions;
- Lack of interoperability between units with many self-contained units that operate on own funds and data sources;
- Isolated development of system applications that provide functionality to a specific business process.

This study investigates the pattern of the adoption of the innovation, in order to understand the rationale and impact on institutional IS planning. The structure of this paper includes an attempt by the author to provide a brief background into the evolution of EA and key understanding of the need for the benefit of its readers. It is then followed by extracts from JISC pilot study report in 2008 as the stated motivation for funding the innovation adoption. The areas of EA applicability are discussed briefly as the discussion is concluded in the final session. The paper also outlined the research methods chosen for the study and analytical approaches. The preceding activities are culminated into a conceptual framework that discusses new themes emerging from the data stating that higher institutions are readily adopting contemporary methods in addressing new challenges encountered.

3.0 Origin and Definitions

John Zachman developed the concept in 1980 (Zachman, 1987). He worked at IBM as a Business Systems Planner and student of Dewey Walker, IBM's Director of Architecture for business systems planning. Zachman described a preset structure, blueprint or architecture of an organisation's IS strategy. The structure is designed to reduce the 'chaos effect' and disintegration of the enterprise. The structure was described as a "Framework for Information Systems" for classifying descriptive representations of an enterprise system (Zachman, 1987). Today, the framework has been adapted as the "Zachman Framework, that helps to define the what, how, where, who, when and why description of an enterprise vision, goal, or product. As businesses evolve, the existing system structure becomes large, out-of-context and non-aligned with the business goal. Organisations end up with legacy systems, outdated and too costly to replace. The Zachman Framework is comprehensive as it addresses the enterprise in its entirety (Zachman, 1987), using very descriptive elements to communicate complex concepts of the enterprise strategy. IBM made the Zachman Framework public in 1987. The framework is an architecture to bridge the gap between a business strategy, implementation and IS alignment (Zachman, 1987). His work with Sowa led to many further descriptions of EA and frameworks (Zachman and Sowa, 1992).

Today, business managers understand the need to coordinate the integration of information systems components in the organisation by understanding the relationships between business processes, processes, systems and supporting technologies in order to determine change behaviours. EA is used as a planning tool and in decision-making by senior management. In 1996, the United States Federal Government advised its public agencies to adopt the holistic approach by using enterprise architecture to align their information systems with business goals (Langenberg and Wegmann, 2004). The Federal Enterprise Architecture Framework, FEAF, was created. Business managers understanding of their IT resources to help solve business problems such as tackling high operational cost, incompatibility of IS systems (Perkins, 2000) and proffers solutions for data interoperability issues (Hamilton, 1999; Segars and Grover, 1996).

The EA idea has evolved with growing interest from other businesses in the private sector that extends from manufacturing, finance, logistics and healthcare. With more research conducted by independent business analysts and protagonists such as Ovum Group, Forrester and Gartner reports transcends EA into a 'maturing discipline.' Infosys Technologies Limited, based in India, conducts the Enterprise Architecture Survey annually. Infosys surveys conducted in 2005-2006 to 2007-2008 are regarded as one of the most recognised reports for EA. The survey conducted in 2005, showed that EA had become established across several disciplines as an enabler of business change and business-IT alignment in small and large organisations (Aziz et al., 2005). The focus is fairly balanced between technical (architectural modeling) and application architecture. EA use was hardly recognised in these previous year until year 2008, although, there has been large-scale implementation and usage of EA in Australian and Canadian Universities. Other organisations within the HE sector adopting EA include a consortium of HEIs in the United States. Active adoption of the approach led to the EDUCASE and ITANA forum institutions and individuals can contribute to. The aim of the body include to share practices in EA among colleagues, artifacts and to act as a voice for IT Architecture in the institution.

Some research criticise the use of the term 'architecture' to describe today's living and dynamic organisations. EA is derived from the combination of two words – 'architecture' and 'enterprise.' The Oxford English Dictionary, (2010) defines architecture as *"the art or science of building; thing built, structure; style of building; construction."* While the European small and medium-sized enterprises define an enterprise as, *"any entity engaged in an economic activity, irrespective of its legal form"* (SME User Guide, 2003). This suggests that HE institutions engaged in economic activities with local and international communities, business, and render services, such as, providing learning, research and development, may be categorised as enterprises.

Every business without any form of architectural description, preset or evolving, can be likened to the Sarah Winchester project (Zachman, 1987; Ross, et al., 2006). The Sarah Winchester house project was conducted with no preset architectural designs or either guided by an architect. An architect intending to build a house has blueprints of

work to be carried out, descriptions of resources, labour, roles, schedules, and plans for contingencies. The business environment is similar in certain aspects; as Architects aspire create an understanding of all aspects of the organisation, from the vision, to the resources – human and technical resources available to fulfil that vision.

Capgemini, one of the world's largest IT service providers, headquartered in France defines architecture as *"a coherent, consistent collection of principles, differentiated into basic assumptions, rules, guidelines and standards that describe how an enterprise, information flow, information system or infrastructure is designed and appears in use"* (Van't Wout, et al., 2010). The Dynamic Enterprise Architecture (DYA®)'s definition of architecture further proposes that an EA deals with "consistency of set of rules and models that guide the design and implementation of processes, organisational structures, information, applications and the technical infrastructure within an organisation." There are business rules govern development of structures and processes for organisations to function effectively (Wagter et al., 2005).

The Institute of Electrical and Electronics Engineers (IEEE) Standard 1471-2000 defines the architecture of an organisation as *"the fundamental organisation of a system, embodied in its components, their relationships to each other and the environment, and the principles governing its design and evolution"*. This definition is used most popularly in other studies (Rood, 1994; The Open Group, 2006). Lankhorst et al., (2005) propose that key issues to be noted include *coherency in defining principles* as well as (Wagter et al., 2005), and methods and models of the IT infrastructure for use within the organisational structure. It has been identified that EA lacks coherency and a standard definition. To the author, it portrays a notable level of inconsistency in the discipline. As a result, some open standards institutions exclude any direct definition of EA in their framework, such as The Open Group's lack of definition of EA, instead define an 'enterprise' and 'architecture' as separate components their frameworks. The EA Research Forum adopted Vaknin's definition of definitions, by an understanding of the meaning, the purpose and function, essential characteristics, and the distinguishing aspect of the term (Vaknin, 2009). The EA definition that was submitted to The Open Group by the Enterprise Architecture

Research Forum (EARF, 2009), propose that EA should be addressed in the under three concepts, namely:

- A 'representation' describing the essential elements of a socio-technical organisation, their relationships with each other and the environment;
- A 'process' as a way to understand complexity and manage change;
- A 'profession' or a discipline of continuous practice.

Literature search conducted by the author shows that there are over 15 definitions of EA currently available, and mainly from practice. The pattern of EA descriptions shows common patterns and terminologies used. These definitions are represented as a 'tag cloud' text created in '*wordle.net'*. The common terminologies used more often and widely have been identified and appear in the diagram below as a cloud of text. The author has conducted this activity in an attempt to draw out common language boundaries around the discipline.

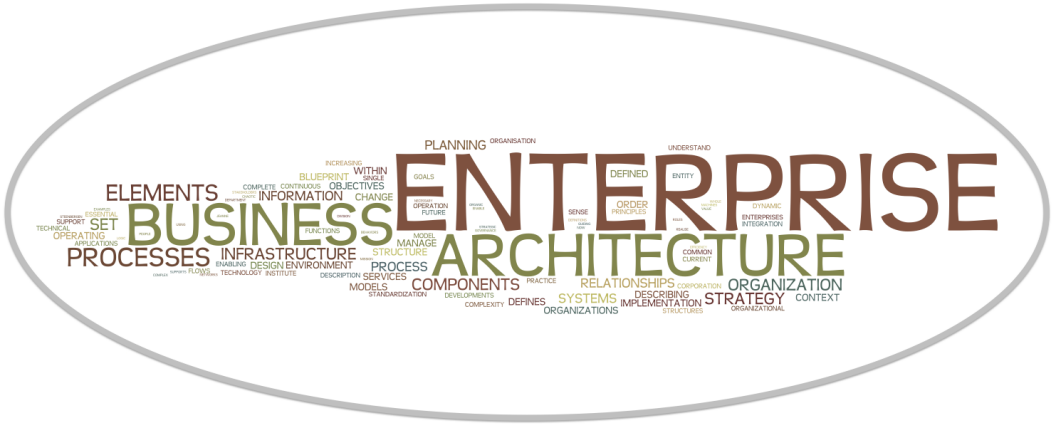

Figure 1. Tag Cloud - EA Definitions. Source: Author, 2011.

Research has shown the lack of academic papers published. In the HE sector, EA is defined as a management technique that is used to align business and IT strategy of an organisation, where it sits at the borders of business and IT management. IT management practice has also evolved and received its due attention in recent years (Argyris, 1977; Brancheau & Wetherbe, 1987; Niederman, 2008). There is the need for IS managers to understand relationships existing between systems, processes, information, applications, and how they steer the organisation. Understanding the enterprise and its entire components means conceptualising various parts or the enterprise and using models to capture current activities. This is only an initial step to

'architecting the enterprise' with respect to systems or process view (Bernus, 2003; Nightingale and Rhodes, 2004) to the desired state. These perspectives, the Author considers insufficient to enterprise performance. The argument proposes that business managers should place the understanding of their core business priorities as foremost on the agenda. This view can hence, be formerly synced with an EA program that identifies business capabilities and capacity to execute the vision. Mainly independent research groups, private practitioners and consultants of enterprise architecture, and tool vendors publish research literatures of EA in the private organisations and very few in the public sector. There is lack of an academic research of EA adoption in the HE sector.

4.0 The Diffusion of EA in HE sector

Diffusion of EA in the HE/FE sector can be defined as, "The process by which EA is spread within the community, over time and over categories of adopters" (Rogers, 1995, Crawford and Di Benedetto, 2008). In HE sector, the level of competition between institutions lack intensity compared to organizations in the private sector. Institutions are not driven by competition to adopt technologies earlier than other institutions, or by the need to be innovators in the sector. Support for these types of programmes with the community is an indication that JISC is a major driver of innovation. Nevertheless, research data showed that institutions use other approaches to look at efficiencies of processes and their underlying systems before the decision to adopt EA. The decision to adopt can also be influenced by two key factors:

(i) Institutional readiness: In JISC's call to bid for EA funding in 2007, institutions needed to show evidence of readiness to do EA, in the form of an established portfolio for IT planning and institutional change. Senior management in these institutions needed to understand the need for an integrated platform across departments, campuses and colleges that are supported by IT services. There needed to be the recognition that IT projects and services should support the overall institutional objectives and are appropriately aligned. The selected pilot institutions were identified to have developed long term plans to support these goals, and were in the process of implementing them. Another goal of the institutional readiness was the recognition of a top-bottom management approach to change and integration across the institution,

or a bottom-up approach to systems-service integration that would support the EA initiative. There needed to be an effective governance structure in place to monitor the development and implementation process. Institutions needed to be inclined to service-orientated thinking in their systems approach, to promote flexible architectures and connectivity. JISC, as a support body for doing EA in HE, needed to ensure that institutions were committed to ensure sufficient sustainability of the practice after the initial pilots. Institutional readiness was also flagged up by the need to understand the bigger picture of business processes, the underlying systems and applications, the services they provided, and the interrelationships between them. These institutions were driven to change and were considered as successful candidates during the bidding process (JISC Circular, 2007).

(ii) Senior management decision: The more traditional universities most unlikely to take risks in changing existing structures and culture of the institution. In other cases, the management decision to adopt can be influenced by the lack of understanding of the concept. Some business managers express concerns for new approaches and innovation; they view them as hypes that would fad sooner or later. This results in a delay to the decision to adopt until adopters can make a good business case, which should prove the benefits of adoption, and sustainability of the innovation. These types of managers are late adopters compared to managers in newer and smaller institutions, who have different drivers. These later managers are willing to take risk in their decision to adopt, and are most likely to be early adopters of such innovation.

On the other hand, there are other institutions that cannot afford to take such risks, even as newer institutions. The management decision is taken independent of the cost of the innovation, as innovation could be seen as either affordable or exorbitant to potential adopters (Tornatzky & Klein, 1982). Hence, cost is defined as a characteristic feature of the innovation-adoption process. In this study, cost is not a characteristic feature of EA adoption in UK institutions due to the resource capability provided by JISC. The funding provides sufficient resources for institutions to adopt EA on a light scale. Institutions were to define focus areas where EA could be applicable. Focus areas could include understanding a high level architecture of the institution, business process improvement, or simplifying the architecture of the

systems and hardware support. Successful adopters were given support to build initial skill requirement and were able to attend workshops on tools and frameworks of doing EA.

4.1 Innovation Characteristics

"Innovation may be defined as an idea, practice, or object that is perceived as new by an individual or other unit of adoption" (Rogers, 1995, p.11). There are several characteristics of an innovation that influence the decision to adopt.

(i) Relative advantage: this is the perceived advantage and benefits EA have over other approaches to IS planning. The benefit it holds is reflected in its ability to align business strategy and goals with IS planning. Proper IS planning is important in effective allocation of IT supply to support the business goals. Other IT management practices, i.e., business systems planning (technology-focus), business optimization (business-focus), project management (project-focus), and Information security management (information-focus), only carry a part view of the organization and how change affect that aspect of the organization. EA provides "a coherent whole of principles, methods and models, ...used in the design and realisation of an enterprise's organisational structure, business processes, information systems and infrastructure" (Lankhorst et al., 2005). In HE, EA use is a high-level focus of the organization, the impact of change, i.e. new market opportunity and changing business models to HE institutions, on the vision, strategic objectives, people, and IS that support core business processes within that institution.

(ii) Appropriateness or compatibility: The question being asked is if EA is compatible with HE 's existing values, previous experiences and current need. Doing EA in HE require institutions to develop partially new skills, especially requirements for intermediaries between the business and IT unit. Business personnel need to understand the underlying effect on the IT infrastructure from frequently changing business processes, and IT personnel need to understand what business needs is to provide adequate support. The end-point of these requirements highlights the need for effective communication skills between business and IT as a way to breed understanding. In EA modelling, the ArchiMate^{TM} modelling language is a tool for

communication between business and IT. From research data, the tool is used for negotiating IT solutions with the business. EA is seen as appropriate for HE sector based on the identified business drivers, which include ongoing requirement for a sector-wide, sophisticated approach to manage IS planning. It includes the need to build systems capability to manage increase in education demand, the need to have cost-effective and efficient business processes, the need for increased IT competence and ability to respond to changing business requirements, and the need for system integration both for internal use and external government reporting requirements.

(iii) Cost: The cost of an innovation determines the rate of adoption (Tornatzky & Klein, 1982; Rogers, 1995). In this study context, the cost issue includes the cost of EA resources. EA tools such as BizzDesign Architect, IBM Telelogic System Architect, Oracle Business Process Analysis Suite and Aris Business Architect are vendor-based types of EA modelling tools. Although, they have advanced functionalities that are used to visualize business processes and IT architecture, HE institutions are unable to fund the cost of annual user or multi-user licenses. This need for a vendor-free tool has led to the development of Archi, open source, cross-platform tool to create ArchiMate models. The Archi tool was funded by JISC, an aftermath of the EA pilots, and was developed by the Institute of Educational Cybernetics at the University of Bolton, in UK. Other major concerns include cost of training for staff to use the EA frameworks and modelling tools. The cost to hire external consultants to help kick start EA in the institution is also of major concern for institutions.

(iv) Complexity: Institutions need to understand the concept of EA as an innovation. Although EA concept has evolved through periods of IS planning approaches, it is a new concept in HE and institutions need to fully understand it before full adoption or further diffusion within the sector. Studies show that new ideas that are simpler to understand are easily adopted more quickly than innovations that require new skills and understanding to be developed (Rogers, 1995). This study research data shows that, EA concept is easily understood in the by members of the adopter communities. A strategy adopted by the JISC is, an EA Practice Group. This is a support function group for the communities of adopters and explorers of EA. The motto of the support

group is “learning by doing,” where practitioners learn more quickly from each other, from individuals, and from other institutions.

(v) Trialability: Large frameworks like the Zachman Framework (Zachman, 1987) and the Federal Enterprise Architecture Framework (FEAF) (FEAF, 2007) are used to model the business high level functions, business processes, systems, hardware, actors, roles and the relationships existing between them. This kind of work will require dedicated resources. EA is divisible and applicable to core functions of the institution that are of focus. The Open Group Architecture Framework (TOGAF) is a non-proprietary and generic framework (The Open Group, 2008) and is adopted by institutions in the HE sector. TOGAF consists of three major elements, which are the Architecture Development Method (ADM), Enterprise Continuum, and the Resource Base. These are divisible elements of the framework that are usable at different stages towards architecting the organization. The ADM is divided into eight phases that can be trialled independently or according to business requirements. A highly divisible innovation is easily trialable and readily adopted (Tornatzky & Klein, 1982; Rogers, 1995).

(vi) Observability: Visibility of the outcomes of an innovation will determine the rate of adoption of the innovation (Tornatzky & Klein, 1982; Rogers, 1995). The effect of doing EA can be seen through the work of some of the pilot institutions; how effective their IS become and how they have been able to get the business people on board EA. These effects are also articulated through the benefits achieved by these individual institutions. EA benefits in the HE sector are not fully realized in immense amounts. There are high expectations of what EA benefits are in correlation with industry research results (Infosys Report, 2008-2009). High on the list of expected benefits for HE institutions include the need to create better alignment between business and IT, which include to help the business develop better business and IT strategies, to improve core business processes, data integration, and the inevitable efficiency gains. From research reports gathered, institutions have experienced more intangible benefits such as, the ability to capture data from different areas of the institution, holding effective communication and negotiating IT solutions for the business. Inspite of these benefits, which include the ability to build systems and

people capabilities, EA practitioners within these institutions state that, there is great difficulty experienced in "selling or making a business case" for EA to senior management without evidence of tangible, cost saving benefits. The inability to show visible cost value does determine the adoption on a wider scale across the whole institution. For senior management to consider serious adoption EA practitioners should consider ways to show some cost value (Anderson & Narus, 1999; Frambach & Schillewaert, 1999).

JISC's understanding of EA is its use as *"a strategic management technique for enabling large companies to adapt to change"* (JISC TechWatch Report, 2009, p. 4). *"EA is a high-level, strategic technique designed to help senior managers achieve business and organisational change. It provides an evolving, dynamic way of describing and aligning the functional aspects of an organisation that includes its people, activities, tools, resources and data or information, so that they work more effectively together, and therefore more efficiently, to achieve the organisation's business goals"*. This is the adopted definition of JISC for the pilot study.

- EA is also about achieving desired future change through design by understanding existing business artifacts.
- EA seeks to model the wider socio-technical environment of an organisation rather than just the technical aspect, capturing understanding of a holistic view of the organisation;
- EA is built for larger corporations that have autonomous business units as compared to HE collegiate structures. Hence, its applicability in HE would be hand-picked for key critical areas with unanimous governing system;
- EA is a communication tool for collaboration between high-level stakeholders (senior management), and low-level stakeholders (business users and beneficiaries of EA work);
- As HE sector seek to tackle levels of complexities and diversities built over the years, EA is recommended as a modernized approach;
- HE approach to adopting EA is described as 'EA-lite' that represents doing EA at departmental level, project by project until it gains momentum, tangible results and full management support for a top-down approach;

- EA for HE is architecting the "core operating model" (JISC TechWatch Report, 2009; Ross et. al, 2006). It provides a framework for some level of standards and integration of core practices, mainly for easy integration of future requirements;
- EA facilitates (tactical) business change from within departments that gradually spreads across the institution. This approach seemed to be readily accepted, as governance structures and senior management support are not easily surmountable;
- EA is a long-term investment in designing the desired 'to-be' state of the Institution.
- EA is a process and not a project. One institution stated that they have to change their mantra from doing EA projects to doing projects that use EA;
- EA is seen as a journey (by designing institutional IS roadmaps), to a desired destination (designing the 'to be' state of the institution).

4.2 Application of Study

The overall aim of the study is to contribute to theory and practice in the IS discipline The intended framework development is aimed at improving further adoption of EA practice in the education sector. The framework could be conceivably, utilised by other researchers aiming to develop empirical frameworks in the HE sector or benchmarking with other public sectors. The research builds on theoretical concepts identified in other sectors, i.e. national government bodies in the public sector and businesses in the private sector. Further concepts have been resolved from the research data gathered and used as codes for the analysis, thereby, identifying issues noteworthy for future study. The framework attempts to address these issues, nevertheless, distinctive to the HE sector.

4.3 Research Approach

The objective of this study is to critically review the impact of EA adoption for IS planning in UK universities. Using data from the JISC pilot studies and transcribed interviews, the data were analysed using thematic methods in qualitative research. Although thematic or template analysis as it is sometimes called, is used mostly in social sciences field. It has recently began to be used in IS management research (Waring & Wainwright, 2008). The pilot launch included 5 institutions as case studies

and they were selected based on that purpose (Creswell, 2009); as the first group of institutions to use EA concepts in building and managing institutional IS. The use of case studies in qualitative research provides a rich source of data for analysis based on preliminary theoretical concepts from similar studies. An in-depth review was conducted into these institutions, to understand key issues common in other public and private organisations that have adopted EA. These issues have been identified to include motivated for adopting EA, as measures to optimise cost and align business strategy with IT strategy.

4.3.1 Data Collection

Further data used for this study were gathered using qualitative methods via semi-structured face-to-face and phone interviews conducted, over the period of 6 months. Creswell, (2009) stated that the researcher's presence might bias the participant's responses during a face-to-face interview. This issue was addressed with a couple of phone interviews conducted in sensitive cases, where the respondents solely gave direct answers to questions asked. This method was adopted to allow flexibility and thoroughness during data collection (Rossman and Marshall, 2006). Top personnel interviewed included Directors of IT centres, IT managers, and project managers in these institutions. These personnel have been identified as EA lead EA practitioners and champions within the HE sector. Other interviewees for the study included key EA consultants who have been identified as change agents within the sector.

Role of Interviewee	Case Study
Head of Strategy and Policy	Pilot Study
Head, IS & T	Pilot Study
Project Manager x2	Pilot Study & Case Study 2
Professor of ICT	Pilot Study
Assistant Director x2	Pilot Study & Case Study 4
Deputy Director x3	Case Study 1, 3 & 5
Business Analyst x2	Case Study 1 & 2, External EA Practitioner
EA Consultant, Private & HE Sector x4	EA Practitioner, HE champions
Systems Analyst x2	Case Study 2 & 5

Table 1. Category of Interviewees

Each interviewee was sent a request letter to be interviewed and some introductory information of the research proposal. The interviews were conducted at various locations and times most suitable to the participants. The time frame of each interview was initially scheduled to run between 45minutes to an hour. At completion, the average time spent on each interview was between an hour and half because most respondents were willing to provide more information about the projects and issues of concern. The interviews were recorded with interviewees' prior consents and later transcribed verbatim.

The table below describes theoretical concepts that guided development of the interview questions, and were also used as pre-defined codes during data analysis. The researcher deemed it appropriate to adopt the pre-defined theoretical constructs (Hjort-Madsen, 2009) for EA adoption in national government agencies and issues identified in higher educational institutions in the United States and Canada, were used to inform the research and also guide the data collection. The studies were conducted using both quantitative and qualitative methods of data collection (Albrecht, et. al. 2004; Maltz & DeBlois, 2005). Both research propose IT as one of

the major areas higher institutions face issues. Current top IT issues survey conducted in UK HEIs by the UCISA group (UCISA Survey Report, 2008; Cooper, 2009), show IT challenge as a key challenge for institutions. Research results show the areas of focus or areas of issues and concern of EA in other public sectors include governance, implementation issues, sustainable drivers for EA, principles and standards (Hjort-Madsen, 2009).

4.3.2 Analysis

Approach to data analysis was the use of thematic analysis due to large volume of transcribed interviews gathered This is an analytic technique for qualitative data commonly used to identify, and analyse large textual data in research (Boyatzis, 1998; King, 2004 in Cassell and Symon, 2004, pp. 257). King and Horrocks, (2010, p. 150) define themes in template analysis as "*recurrent and distinctive features of participants' account, characterising particular perceptions and or experiences, which the researcher sees as relevant to the research question."* A thematic network was developed (Attride-Stirling, 2001) as an approach towards qualitative data analysis by using sets of themes at different levels during the process.

5.0 Results and Discussion

The report compiled at the end of the pilot study highlighted key pointers to the practicalities of the innovation:

- The EA innovation gained sufficient support as indicated by the universities that participated;
- The Enterprise Architecture Practitioners' Group proved a good understanding of the concepts of EA and successful adoption of the practice extending beyond the pilot institutions;
- JISC understands issues of practicalities and propose that EA needs to be brave and bold;
- JISC understands propose that institutions need to look at the bigger picture of doing EA.

The drive for EA is based on institutional need to be effective in an increasing competitive environment, the need for savings derived from efficiency gains in IT investments, and the need to move with the wave of new Information and Computer Technologies in learning and administration (JISC TechWatch Report, 2009).

Project	Focus of project	Facts of EA adoption
KEAP	Integrated e-infrastructure to support research.	Pre-92 Institution largely federated. Campus-wide, devolved decision Making governance structure. Traditionalistic approach to modern IS approach. Bottom-up approach to EA.
LEAP	Business processes and technical systems infrastructure.	Post-92 Institution, established Governance structure. Inclined to forward, modern thinking. Central IT governance structure. Top-down' approach to EA.
Lean EA	Process improvement, new governance structure.	Pre-92 Institution largely federated. Devolved governance structure. Traditionalistic approach to modern IS approach. Lower level Top-down approach to EA.
CAIRO	Business Processes, Systems and Data Structures	Post-92 Institution, largely centralised. Central IT governance and decision making structure. Inclined to modern thinking. Top-down approach to EA.

Table 2. Summary of institutions and approach to EA

The table shows some emerging issues in EA adoption in UK HE context.

EA labeling was an identified issue as most stakeholders' group struggled with adopting 'another' IT concept within the HE sector. The sector is perceived as fragile compared to government-run agencies or the private sector. - Language, Terminology
Scale of EA work seems unachievable within a short time frame and EA is needed to match up the urgency of the socio-economic times.
Full **support** from senior management, decision makers and key stakeholders is needed for strategic alignment of EA and business goals
Communication is required between business and IT groups to understand the role EA plays in the context. Communication skill is vital, hence, for EA leads.
Scope of areas to be covered by EA and how to decide its appropriateness. Scope of where EA fits within the institutional plan and structure.
Governance structures are not readily compromised within institutions, hence leaving EA governance to act within a 'mushroom' context. - Stakeholders' group
Tools and common standards in modeling the enterprise between individual modelers and institution. - Varieties, Training, Availability
Frameworks are vital to doing EA work and most frameworks are overly indulgent for small institutions and level of EA work to be carried out. - Complexity, Flexibility, Relevance, Suitability
Skills needed for EA in HE sector was not entirely lacking as lead practitioners within institutions embarked on intensive training an workshop sessions to develop needed new skill set.
Costs of doing a large scale EA work hindered some other institutions as the focus tended towards how to achieve more (benefits) with less (resources)
Expertise - Outsourcing, Integration, Learning from doing
Dedicated Roles - Enterprise Architects, Small teams
Knowledge gap and lack of experience were identified as areas needing attention for members of projects under EA concepts. It was carried out as a steep learning curve for members to take on.

Table 3. Emerging issues in HE EA adoption

6.0 Conclusion

This paper does not provide further synthesis of the analysis, but will be discussed in detail in future papers. Hence, two main objectives of this study was to discuss what EA meant in HE and particularly in UK HE, and to highlight emerging issues identified during the course of the study. This study shows that UK higher educational institutions have already began to accept EA concepts as a change enabler, much needed in these current socio-economic climate. Despite the challenge to engage top management in EA discussions, EA leads in institutions are proactively using EA principles in small scaled-projects across the institutions. Further findings show that the tangible impacts for institutional change may take a little while, but practitioners are not relenting in building EA skill sets. As in other private organisations, where cost is one of the motivators, HE sector's perspectives in cost are in aspects of adapting frameworks and resourcing in doing the actual work. HE seems to find ways around to be creative with resourcing, and doing more with less is the adopted slogan. In summary, the following cloud text highlights what EA means in the sector context.

6.1 Issues for Consideration

a) Gaining full management support
b) Making a good business case
c) Resource committal to support EA work
d) Working with stakeholders.

Some of the issues that would need to be addressed before full adoption include:

(a) Identifying appropriate governance models;
(b) Identifying levels of EA maturity;
(c) Persuading other institutions with favorable EA benefits;
(d) Resolving resource demand for EA work;
(e) Identifying suitable approach to doing EA.

How is the sector prepared to deal with the issues and concerns adopting EA brings today? The diffusion of EA in the HE sector, referencing the work of diffusion studies

(Rogers, 1995; Crawford & Di Benedetto, 2008), indicated that EA champions and practitioners, would be responsible to diffuse the practice within the sector. EA knowledge is increasing among IT practitioners and strategic business managers. An increase in the knowledge and understanding of EA principles forms a core persuasive element to the diffusion process. Early adopters may also need to be able to show that EA is valuable to individual institutions and the sector at large. Although, these institutions stated various types of difficulties in the ability to articulate tangible EA benefits, they agree that EA is beneficial to the sector because institutions are able to apply some level of sophistication to IS and institutional strategic planning in current state of affairs in HE. It is also important to note that EA adoption in the sector began four years ago, and has continuously gained momentum in growth.

7.0 References

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