

ENTERPRISE ARCHITECTURE STRATEGIC FRAMEWORK

Tiko Iyamu, University of the Western Cape, Cape Town South Africa, connectvilla@gmail.com
Suama Hamunyela, University of Science and Technology, slhamunyela@polytechnic.edu.na

ABSTRACT

The alignment between business and IT is critical for formulating optimal organisational strategies, and obtaining a competitive advantage. Conversely, alignment between the business and IT units is often challenged in many organisations. Some occurrence of deficiencies in the organisation is due to lack of formal approach such as Enterprise Architecture (EA). The deficiencies sometimes threaten activities such as standardisation, implementation and support for ICT infrastructures. Analysis revealed that the deficiencies manifest into complexities and inconsistencies, affecting organisational goals. Also, without EA, some organisations are challenged with a holistic view, to monitor and manage its business processes, information flow, technology selection and deployment.

Other factors that pose challenges to the competitive advantage of organisation are adaptive-ness, uniformity and scalability, which EA is intended to address from strategic perspective. Unfortunately, many organisations do not have strategic framework for the implementation of EA. This has significant impact on the organisation's processes and activities. This study made use of empirical evidences, from qualitative case study to develop a strategic framework, which could be employed in addressing non-technical factors that affect EA.

Keywords: Enterprise Architecture (EA), Framework, ICT and Strategy

INTRODUCTION

Many organisations strive hard to achieve more comprehensive and workable solutions to manage the environmental transformation and demands, for increasingly better service. According to Chuang and Lobberenberg [1], “the escalating economic and societal demands, together with continued mainstreaming of information and communication technologies (ICT), and the growing trend of service emergence, set a growing agenda for the architectural development of the organization”.

To continue to improve upon service offering, it is not as simple as said or proclaimed, as many organisations operate either in complex or unstable environments. This could be attributed to a continuous transformational cycle in which many organisations frequently embarked upon. According to Song and Song [2], organisations are constantly phased with rapid changes, especially the business and IT environments. As such, EA should focus on strategic purposes for stability, and to help direct the activities of the organisation.

Strategic intent of organisations depends on many factors such as scope, requirements, and competitiveness. Shah and Kourdi [3] defined EA as integration of organisation's elements such as people, processes and applications, and their relationships to each others, to guide design and evolutions. Similarly, Kaisler et al. [4] defined EA as: “*Set of processes, tools and structures necessary to implement an enterprise-wide coherent and consistent Information Technology architecture for supporting the enterprise's business operations*”.

Fraga and Llorens [5] unveiled evidences to support the notion that organisations have taken interest on the EA practices, in order to assist with the growing organisational demands, which are fostered by the change in the working environments. According to Jonkers et al [6], the EA can assist organisations to develop strategies and incorporate them with: (1) existing processes, (2) ICT infrastructure and (3) other modules of the organisations. However, to ensure that the benefits and efforts of the EA are achievable, the organisation needs to be committed to strict planning and execution mechanisms.

The synergy of the different organisational facets (such as goals and objectives; data and processes; and business applications) is of great importance and criticality to the survival of many organisations [7]. The EA is intended to bring changes to organisations. Within this context, Iyamu [8] argued that technical requirements are as important and critical as the business requirements in the engineering of change such as adaptiveness, innovativeness and alignment through the EA. Thus, we explore more on enterprise architecture to gain more understanding of approach to business goals.

ENTERPRISE ARCHITECTURE

In spite of the growing interest in the concept, the development, implementation and institutionalisation of the Enterprise Architecture (EA) in the organisations pose challenges, making its strategic use difficult. This is one of the motivations for the increasing studies on EA. Even though some studies such as Iyamu [8], Guitierrez et al [9], and Ross et al [10], have explored the development, implementation, as well institutionalisation, the challenges remain. The difficulties and complexities associated with the development and implementation of EA could be attributed to its importance in ICT environment, and the organisation at large.

The business and ICT units depend on each other, on the basis of technical and non-technical factors' relationship to enhance activities. Hence it is critical to understand and define EA into domains such as business, information, technology, and application architectures. The four architecture domains depend on each other. The characteristic of dependency is viewed in a study carried out by Buchanan and Soley [11]. To elaborate further on the phenomenon, Iyamu and Mphahlele [12] posit that the development of the information architecture is dependent on the establishment of the business architecture.

Pulkkinen [13] argued that it is critical for the organisation to take all four domains into consideration before designing and developing the EA, because considering only one dimension to inform decision making on the rest of the domains is a challenge. According to Lankhorst [14], the business domain is used to define products and services rendered to the customers by the organisations. According to Winter and Fischer [15:9], "Typical artefacts represented on this layer are value networks, relationships to customer and supplier processes, targeted market segments, offered services, organizational goals, and strategic projects".

The combination and dependency of the four domains of the EA enforces its strategic nature for organisational purposes. For example, the information architecture is critical towards information needed to drive and support the business process and functions in the organisation. Jin et al [16:293] posit that technology architecture is "describing the capabilities which support the business, data and logic software and hardware of application services deployed, including IT infrastructure, middleware, network, communication, processing and standards". One of the professional bodies of architecture, as shown in Figure 1, "The Open Group" [17] defined the application domain as a plan for modelling the application systems, their relationship to each other and how they relate towards the business processes.



Figure 1: The architecture development method cycle

Based on Figure 1, The Open Group [17] defines the EA to be used “to denote both an entire enterprise, encompassing all of its information systems, and a specific domain within the enterprise”. From the definition of the EA, Open Group then defined their framework (TOGAF) as a tool to institute the development of different architectures in the organisation, while utilising methods and standards for designing information systems. According to Buckl et al [18], due to the generic nature of the EA management approach, the information model of TOGAF is designed to cover the concepts as needed in adopting the EA.

Due to the relevance of the EA to many organisations, many studies including this have been conducted to understand why things happen in the way that they. The studies employed various methodological approaches. Based on the objectives of this study, methodology was carefully selected, as discussed in the next section.

METHODOLOGY

Research case study approach and qualitative method were employed in this study. This was mainly to be specific, and to have interpersonal contact with the participants, as a result of the complexities of human involvement Creswell [19].

The organisation, JVT Enterprises was selected on the basis that there was evidence that they deployed EA. Another reason for selecting the organisation was that they showed interest in the study. Many organisations were contacted but for various reasons such as sensitivity, declined to participate in the study. JVT Enterprises is a South African owned company

The semi-structured interview approach was used in the data collection. This was informed by the intensity of data collection, and the necessitated interaction which had to happen between the researcher and the participants. According to Dawson [20], the semi-structured interview approach enables the researcher to instantly probe the interviewees. A total of thirteen employees from both business and IT units, and at different levels in the organisation were interviewed. The interviewees’ selection was based on their availability, and closeness to the subject of EA. Also used as criteria was length of service in the organisation. A length of at least three years was used to ensure that the interviewee have a good understanding of the organisation.

The objectives of the study were to understand the significance of EA, investigate how EA was developed and implemented in the organisation, and examine the challenges that were encountered in the development and implementation of EA in the organisation. Questions were formulated to achieving the objectives: (i) How was the EA developed and implemented in the organisation? (ii) What were the challenges that were encountered in the development and implementation of EA in the organisation? (iii) What was the significance of EA in the organisation?

The data analysis was carried out, using the interpretive approach. Interpretive approach provides insight through which a deeper understanding can be gained of real life experience. According to Hovorka and Lee [21], the interpretive can be used to achieve an understanding of lived experience, however, the meanings which the researcher brings in is critical to avoid biasness.

DATA ANALYSIS AND DISCUSSION

Based on the research objectives as presented in the introduction section, questions were formulated. The data analysis and discussion are therefore presented in accordance to the three research questions:

- i. What is the significance of EA in the organisation?

The organisation deployed the EA in order to realise competitive advantage and for the purposes of return on investment, particularly on ICT infrastructures. In JVT Enterprises, the development and implementation of EA was intended to standardisation and management, as well as to minimise the ICT expenditures, mainly towards the operational costs. Also the development and implementation of EA was geared towards strategic approach to accumulate competitive advantage. The significance of EA in the organisation relied on communication from the promoters and their individual knowledge of the subject. Based on these factors, communication and knowledge, the employees interpreted the significance of EA in their organisation. What was critical in their interpretation was a shared vision among the stakeholders.

Communication was seen as critical in the organisation. It was used as a medium where the significance of the EA development and implementation was promoted and communicated. However, the organisation experienced a lack of commitment towards EA development and implementation communication. This was because some of the stakeholders in the organisation didn't understand the benefits of the EA in the organisation. They viewed EA as insignificant because they strongly felt that the development and implementation of EA would only benefit certain departments or groups, and not the entire organisation.

According to some of the interviewees, particularly architects, *different perspectives about the importance of the EA development and implementation exist in the organisation, and this is sometimes caused by lack of education.* In the organisation, lack of knowledge about the principles of EA contributed to the different views. Knowledge was critical regarding the individual's interpretation of the significance of EA in the organisation. Due to lack of education and awareness about the EA in the organisation, the importance, and the development and implementation themselves were impeded. Some of the top management struggled to understand the need for the development and implementation of EA within their space, and within the organisation at large.

Political interference also contributed to how the individuals interpreted the significance of the EA development and implementation in the organisation. The different groups in the organisation considered the development and implementation of EA as significant only if it added value to their individual interests or agendas. According to one of the interviewees, *some senior personnel were protective, and as a result, they failed to adjust their resources (people, processes and technology) to support the development as well as the implementation of EA.* This was empirically found to be true. As a result, the importance of the EA deployment was individually determined and this challenged the process of EA deployment in the organisation.

- ii. How was the EA developed and implemented in the organisation?

The TOGAF framework was followed in the development and implementation of EA in the organisation. The framework was selected because it was argued to provide the tools and approaches necessary for the development and implementation of EA. The interviewees in the organisation provided information that suggested the suitability of the TOGAF framework. The responses are summarised below:

The organisation mandated the IT unit to oversee the development and implementation of the EA, with the support, and under the auspices of the CIO. Even though the TOGAF framework was followed, EA development and implementation was enabled, and at the same time constrained by the strategic objectives of the organisation. The enablement and constraints were made possible through different factors such as people, processes and technology due to their critical roles.

The development and implementation included different personnel at various levels such as the CIO, IT architects, team leaders, business analysts, managers, technicians and programmers. Some of the personnel who were involved in the development of the EA were not involved in its implementation. This was due to the fact that the skills and expertise required in both tasks were different.

The CIO and the Chief IT Architect were responsible for managing the activities (such as defining EA development and implementation tasks, and communicating with the rest of the stakeholders.). In addition to the TOGAF framework, the organisation made use of their existing rules, regulations and standards to define and execute the processes and activities in the development and implementation of EA. According to one senior employee in the organisation, *it was essential to institutionalise and put into effect: ethical conduct and professionalism; and proper use of the organisational technology and processes for the achievement of the EA development and implementation, instead of personal interests.*

The development and implementation of EA in the organisation was modelled into four deliverables, namely the business, information, application and technology architecture. This was done in alignment with the TOGAF framework. The different deliverables were continuously tested, against the organisation's requirements, particularly during the development and implementation of the EA. One of the IT architects explained that the testing approach, as well as requirements' fulfilment was defined by the organisation as part of its standard.

- iii. What were the challenges that were encountered in the development and implementation of EA in the organisation?

The focus was on the non-technical factors which posed challenges to the development and implementation of EA in the organisation. As empirically gathered, the primary challenging factors to the development and implementation of EA in the organisation include politics, organisational structure, communication, and roles and responsibilities.

The organisation was challenged with factors which manifested from human actions during the EA development and implementation. For example, some of the employees used their official mandates to pursue personal enrichment, and made use of the power of their authorities to dominate others, through which they tried to silent voices of different views. At some points, there were more emphasises on human actions that were not related to EA than technical issues.

It was evident that politics affected the development and implementation of EA in the organisation. Owing to power struggle in the organisation, some of the employees used the development and implementation of EA as sources to further their domination and authority. One of the interviewees shared her view about politics associated to distribution of resources. According to the employees, *the EA deployment was hampered owing to a lack of crucial resources (people and technology) because some of the senior personnel felt that committing their resources to the development and implementation translates into loss of power or authority over their domains or resources.*

In addition, politics were experienced in the form of employees' creation of networks of friends within the organisational structure. The networks were driven by their personal agendas. As a result of such practices, there became conflict amongst the groups of networks over domination and power to lead or control. It became clear that some of the employees felt the need to associate with more influential network for the EA development and implementation to succeed.

Another factor which posed a challenge to the development and implementation of EA was organisational structure. Majority of the senior IT Architects and other IT managers made it clear that if the organisational structure was not

properly defined and adhered to, challenges were realistic, and will impact and influence the EA development and implementation. Organisational structure manifested into governance, roles and responsibilities and allocation of tasks, which at the same time enabled and constrained the development and implementation of EA in the organisation.

In summary, non-technical factors such as communication, skill-set, roles and responsibilities were vital for the development and implementation, including strategic use of EA. Some of the factors are not new in the development and implementation of EA, from one organisation to another. What is more important is how they were used to enable and constrain processes and activities.

It was clear that the EA development and implementation were more affected by the human actions than technological artefacts. There was lack of governance within the organisational structure, which created imbalance of non-technical challenges. Some of the challenges were produced and reproduced through unethical actions and behaviour. Other factors which were interconnected to governance, and were also reproduced and derailed the development and implementation of EA in the organisations include:

- i. Communication was critical in translating the importance of EA development and implementation across all units and employees of the organisation. It was also important to drive the awareness and buy-in from key stakeholders. Due to the lack of proper communication channels, the EA development and implementation were interpreted insignificantly and unjustifiably.

Communications about EA deployment were often filtered and intended to reach all employees, through different channels as defined by the organisational structure. Unfortunately, some of the key role players failed to commit their full attention to the EA deployment, particularly the communication. This was attributed to the fact that some of the stakeholders were committed to other ongoing projects. Also, the different groups or communities defined their own communication channels instead of abiding by the one defined within the organisational structure. Communication could be used as a strategic approach to improve their synergy and communicating objectives. However, most of the employees perceived lack of communication as the downfall of the EA development and implementation in the organisation.

- ii. Roles and responsibilities were important in the development and implementation. Identifying individuals with adequate experience and knowledge in the organisation was also important to the process of allocating roles and responsibilities. Due to the lack of knowledgeable IT Architects, the development and implementation of EA was continuously challenged in terms of service delivering.

Even though roles and responsibilities were defined, some of the employees stated and claimed that understanding of their roles was a challenge to them. This drew some conclusions that there was a lack of accountability and ownership when it came to their roles. As a result of lack of clear roles and responsibilities, accountability fostered delays of EA activities, decision-making and defining different levels of authorities. One of the employees argued that the process of assigning roles and responsibilities was unclear. Another employee explained that the individual roles and responsibilities were inherited from the existing organisational structure or defined if necessary. This phenomenon could be related to the lack of process definition in the organisation.

- iii. Another challenging factor in the development and implementation of EA was lack of skilled personnel. This was heightened as some of the senior personnel refused to share their resources (e.g. technology, processes, people and knowledge). They used what they had as a source of power to dominate and gain control, which impeded the development and implementation of EA in the organisation.

The CIO, IT Architects and other stakeholders played a critical role in the development and implementation of EA. However, the lack of skilled personnel was constraining in the allocation of key roles and responsibilities development and implementation of EA. Such deficiencies made the JVT Enterprises to suffer from delayed in

the EA development and implementation activities, and incorrect deliverables as a result of requirements' misinterpretations.

- iv. The development and implementation of EA within the organisation's rules and regulations was important. It was of significance that EA development and implementation enable and support Business and IT alignment, current business processes, and technology adaptiveness. Hence, it is important at all times that governance is established to avoid constrain, and guide EA development and implementation. Not only is it important for the actual development and implementation processes, but it is necessary to ensure that employees abide by the rules and regulations of the organisation. Without proper governance, misconduct and uncontrolled practices could surface among the employees and this could constrain the EA development and implementation completely.

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Based on the analysis and discussion presented above, some factors were found to be of vital important and influence on the development and implementation of EA in the organisation. This could also be said of other organisations, as a particular case could be used for generalisation. The factors include organisational activities, innovation, governance, and deployment. From the findings, a framework, Figure 2 was developed.

As shown in Figure 2, the framework has four layers, twelve interconnected factors for both current and future states. The aim of the Framework is to guide managers and promoters, including architects in the development and implementation of the EA. Through the framework, challenges posed by non-technical factors such as business and IT units' alignment, organisational adaptiveness, reducing complexities, and increase scalability can be addressed within organisations.

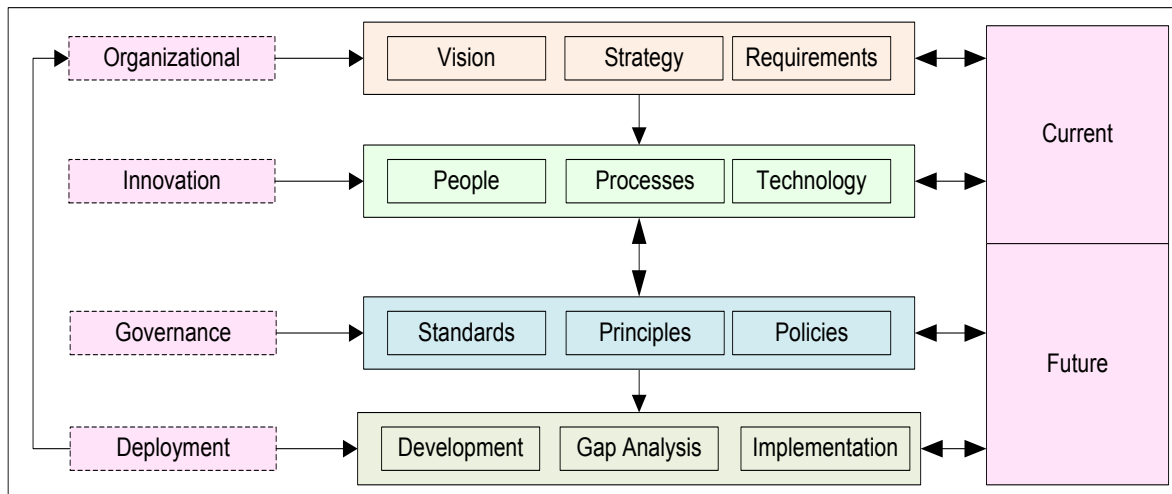


Figure 2: EA Strategic Components

As shown in Figure 2, the most critical of the factors which impact and influence the EA in organisations are categorised into organisational activities, innovation, governance and deployment. The factors are considered most critical primarily because of their prevalence and significance roles, as revealed in the analyses of the case study. The categories as discussed as follows:

Organisational Activities

The main activities of the organisation are vision, strategy and requirements. The organisational activities are considered as the drivers for the development, implementation and practice of the EA in the organisation. The

activities focus on the sustainability and competitive advantage of the organisation, and as such, they influence and impact the development and implementation of EA. The activities are discussed as follows:

- i. Vision – The vision is the organisational statements which provide a clear and articulated direction for the organisation to operate. It explicitly states the primary goals of the organisation. This is fundamental to the development and implementation of the EA. To achieve the vision, the organisation employs an organisational strategy.
- ii. Strategy - The strategy is an articulated plan aimed to achieve the organisational goals. The plan focuses on the sustainability of the organisation overtime. The plan enables the organisation to carry out its processes and activities mainly for competitive advantage. The EA is intended to compliments the overall organisational strategy. The strategy is constituted by both the business and Information Technology (IT) strategies. Based on the strategy, the organisational requirements are derived.
- iii. Requirements – The organisational requirements are derived to achieve the strategy and vision of the organisation. It codifies the common functionalities and needs of the organisation for a given period of time. Hence it is a driving force for the development and implementation of the EA in the organisation.

Organisational activities are enabled and enabled by innovation. It takes into considerations the current and future state of the organisation. This is driven by the organisational structure. The organisation structure is the anatomy of any enterprise. Within organisational structure, certain innovations constituents are defined or exist. Hence, the organisational activities inform and drive the innovations in the organisation. The innovative constituents are critical towards the deployment of the EA in the organisation. The innovation is discussed in the next paragraph.

Innovation

Organisations are continuously challenged by ensuring the survival and wellness of their existence and competitiveness. Hence there is need to continue to innovate. Innovation is aimed to provide improved approach for efficiency and effectiveness in enabling and achieving the organisational activities as described above. There are three main factors which constitute innovation. They include people, process and technology, which depend on both current and future states. The factors form a cohesive alignment of critical resources which are necessary in the realisation of the EA deployment in the organisation. The factors are discussed as follows:

- i. People - people are assigned to various positions within organisational structure, which consist of different roles and responsibilities. Innovations are results from people's actions, which are reproduced overtime and space. Innovations also happen through execution of roles and responsibilities. Innovation is critical in the development and implementation of EA. For example, people decide on what to innovate, how to innovate, when to do, more importantly, how to use innovation to make a difference. Hence people are very important in the development and implementation of EA, and within the organisational structure at large. However, people follow process during innovation, and in the use of the innovation.
- ii. Process - The process is considered as normalised procedure which is often mandated through organisational structure. It defines how events and activities should be carried out. Without process, execution of events and activities will be chaotic. Process is essential in the development, implementation and practice of the EA in organisations. In the development, implementation and practice of the EA, some of the activities where process is critical include communication, decision making and task allocation. Technology is used to enable and support process. Process is often relied upon in carrying out organisation's goals and objectives. At the same time, process could a constraint, in the case of IT managers who refuses to release resources for the development and implementation of EA.
- iii. Technology - The EA facilitate the implementation and management of different technologies to support and enable organisation's activities for competitive advantage. Technologies are selected deployed people through processes for various reasons at different times. Organisations' reliance on technology is rapidly increasing. As a result, it is crucial to ensure its viability, as defined and mandated by the organisational structure

The innovations are done within the frame of current and futures states. Otherwise, the purpose will be defeated. For example, if the idea already exists, it is no longer an innovation. The innovative activities are produced and reproduced within the governance activities of the organisation. The governance activities enable and at the same time constrain the activities of the innovation in many organisations.

Governance

The governance consists of standards, principles and policies for current and future purposes. The governance ensures that the organisational activities including innovation as described in Figure are monitored, measured and managed. The governance is employed by, and through the organisational structure. It therefore enables and could as well constrain the activities and events in the organisation. For example, based on the power bestowed on an IT manager through organisational structure in JVT Enterprises, he decided to apply governance (through tasks allocation) as deem fit irrespective of the consequence to EA development and implementation. The components of governance are discussed as follows:

- i. Standards - The development and implementation of EA is carried out through standards. Standardisation of activities is considered important, mainly because it eliminates ambiguity, and formalises approaches to be followed. It enforces uniformity, which is often intended to reduce complexity. Without standards, the EA development and implementation could produce different result and ultimately fail to align to the business strategies, vision and requirements. To ensure that the standard is realised and enforced principles are formulated.
- ii. Principles - Principles are important for the deployment of the EA in the organisation. They act as guiding measurements through which elements; components, activities and processes are defined, monitored and managed. This helps the organisation with quality and rules. Principles are used as point of reference. They are often enforced through policies as dictated by the organisational structure.
- iii. Policies – The policies consist of rules and regulations of the organisation. The policies are formulated and enforced through the organisational structure. As a result, the innovation within the organisation is influenced by the policies at the time. The rules and regulations determine how the EA is developed, implemented and practiced in the organisation. Therefore, the policies are critical in order to ensure that people deploy technology accordingly in carrying out processes and activities in the course of development, implementation and practice of the EA. Otherwise, individuals and groups would embark on personal interest rather than organisational interest.

Through its rules and regulations, governance enables and supports the activities which are involved in the development, implementation and practice of the EA in the organisation that deploys it. As such, deployed is done within the frame of governance to ensure that it meet its objectives.

Deployment

In the context of this study, deployment was defined as entity which consists of development, gap analysis and implementation stages. The deployment aligns with the current state, and the future is taken into consideration. At this point, different people, technologies and processes, including governance are required for each areas of deployment. The deployed is informed and driven by the organisational activities, which include business vision, strategies and requirements. The components of the deployment are discussed as follows:

- i. Development - The development of the EA includes translation of the organisational (business) requirements, analysis of technological artefacts, planning and scoping of the activities. The planning stages take into consideration the availability of resources (people, processes, technology, finance and timeframe). The business requirements determine the scope of the development. The development of EA categorises the domains into technical and non-technical such as technology infrastructure, application (software), information and business.

The domains of the EA depend on each other during development. The dependence is influenced by the organisational structure. Also influenced by the organisational structure is the allocation of tasks during the development. The development of the EA requires gap analysis before implementation. This is to ascertain, assess and ensure that the purpose has been achieved against the current state.

- ii. Gap analysis - Gap analysis takes into consideration the current situation in the organisation, and compares it to the future (intent) state. The analysis is conducted to detect deficiency, and avoid duplications. This gap is carried out the frame of the organisational activities. This is done through the various domains of the EA. The completion of the gap analysis leads to the implementation stage of the EA.
- iii. Implementation – This is the final stage of the EA deployment. The intention is to achieve the organisational activities through its implementation. It is intended to achieve the desired state against the current state. The implementation is carried out by people, through processes, and using available technology. The implementation is defined by the structure of the organisation. Hence organisational structure is vital if the implementation is to achieve its objectives.

In summary, the four components as illustrated in Figure 2 are influenced and impacted by the organisational structure, to enable and support the organisation for competitive advantage. These are continuous activities in an iterative manner. Otherwise, it becomes difficult or impossible to sustain the organisation and competitiveness is challenged.

CONCLUSIONS

As has been from other studies, this study contributes to understanding some of challenges which derails the development and implementation of EA in organisations. This makes case for why institutionalisation of EA is difficult. The study revealed how non-technical factors manifest themselves in the enabling and constraining of the activities which are involved in the development and implementation of EA.

The Manager of business and IT units, particularly the promoters of EA should gain a deeper understanding on why things happen in the manner that they do during development as well implementation of EA. Also researchers can take a leave from the study and explore further, on human and other non-technical interconnectivity through the duality of events in institutionalisation of EA.

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