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ABSTRACT

Organisations are being challenged to ensure that IT delivers on business requirements, but more importantly to ensure that IT can provide greater differentiation and competitive advantage in the context of business, as opposed to the traditional supporting role that many IT professionals have become accustomed to. There needs to be a drastic change in the relationship between IT and business, in order to address the challenges that organisations are currently experiencing and will be experiencing in the future. This change can only be achieved when IT can demonstrate real business value to organisations. SOA, EA and the relationship between them provide a means to achieve the relationship between IT and business by providing a means of defining and implementing business capabilities. This research focused on investigating the guidelines that are needed for SOA to enable EA, in order to provide practical steps that organisations can use for the alignment of SOA and EA.

KEYWORDS

Enterprise architecture; Service Oriented Architecture; Relationship between Enterprise Architecture and Service Oriented Architecture; Guidelines for SOA to enable EA.

INTRODUCTION

The purpose of this research was to investigate the role that Service Oriented Architecture (SOA) plays as an enabler for Enterprise Architecture (EA). Traditional EA focuses on the crafting of a plan and not the implementation of a solution whereas SOA focuses on the implementation once the planning was done (Linthicum 2008). The purpose of EA is to define the entire organisation in the context of its people, processes and technologies (Sessions 2007). SOA is a means of implementing the capabilities of an organisation, in a reusable manner, that allows for the creation of an agile organisation (Homann 2006). Although both concepts have been in industry for a significant period, EA longer than SOA, there still seems to be confusion as to roles of each and how they relate to each other or even whether they relate to each other at all. Lapalme (2011 :5) discusses three schools of EA and defines them as follows:

1. "Enterprise Information Technology (IT) Architecting School – EA as the glue between business and IT.
2. Enterprise Integrating School – EA as the link between strategy and execution.
3. Enterprise Ecological Adaptation School – EA as means for organisational innovation and sustainability".

As organisations mature in their understanding of business and IT alignment, they begin to evolve between the different schools to the point where EA becomes a means for organisational innovation. The ability to solve technical integration problems is not enough to justify an investment in terms of funding -, organisations want more (Homann 2006). Every

technology investment needs to be justified and aligned to a business imperative or else CIO's will continually be asked to trim their budgets (Tynan 2011). In order to ensure that business need drives IT investment, there needs to be alignment between business and IT both from a strategy and technology perspective. By exploiting the relationship between SOA and EA, this alignment can be created. The premise used as a basis for this research was that EA is used to align business and IT from a strategic perspective and SOA is used to align business and IT from an execution perspective which is aligned to school 1 and 2 as highlighted above.
Linthicum (2008 :1) highlighted the following issues as some of the major contributors to the confusion between the role of SOA and the role of EA:

- "Traditional EA focuses on the creation of a strategy rather than implementing a strategy. SOA addresses the implementation after the planning has occurred.

- Traditional EA is not funded for implementation; the focus is on the creation of the strategy, the plan or the means with which to move an organization forward strategically. Moreover, many enterprise architects just seem to serve as the resident guru and hold no real political or budgetary power.

- Traditional EA is leveraging well-defined processes, approaches, and methodologies that in some instances are difficult to map into SOA."

Our focus was on the above mentioned issues as outlined by Linthicum (2008), with the goal to investigate the role that SOA plays as an enabler for EA and to provide a set of guidelines that can be used by organisations and practitioners to enable their EA efforts. In this paper we first provide some background related to EA and SOA, the relationship between the two, give an overview on the method used in our investigation, provide the guidelines derived and provide a conclusion towards the end of the paper.

BACKGROUND

In this section, we provide background on Enterprise Architecture (EA), Service Oriented Architecture (SOA) and we reflect on the relationship between EA and SOA.

Enterprise Architecture (EA)

EA was first introduced by Zachman in 1987, in order to provide a means to descriptively represent objects in a specific context in order to highlight the relationship between different objects. The increasing complexity of organisations created a need for the ability to represent this complexity in a manner that could be more easily communicated. Townson (2008) highlighted a fundamental challenge facing organisations with regards to alignment between business and IT, and the role that EA can play in creating alignment by describing the relationships between business and IT. Organisations have continuously been challenged with the question of how to justify the IT budget especially when there seems to be very little evidence stating that this supporting function is adding any value to the bottom line of the organisation especially in non- IT businesses. According to Sessions (2007), EA has been in the industry for more than twenty years and its initial focus was to address two key problems, namely: systems complexity and poor business alignment. There are many variations of the definition of EA (Stenzel 2007), and even today industry experts still do not agree to one universal definition. However, most definitions include that EA focuses on describing an organisation in terms of its information, applications and technology and linking that to the organisations business strategy (Stenzel 2007). EA has also been identified as a means to aligning business and IT, cost reduction or to facilitate change (Lucke, Krell & Lechner, 2010); (Lapalme 2011). In terms of this research, the definition below was the preferred definition of EA, since it provides a comprehensive description of EA.

> "Enterprise Architecture is about understanding all of the different elements that go to make up the enterprise and how those elements inter-relate. Enterprise Architecture embodies a set of principles, rules, standards and guidelines, expressing and visualizing the vision, culture & behavior of an organisation while implementing certain concepts that serves as prescription for the design and construction of a certain object type. It contains a combination of style, engineering and construction principles, guaranteeing the uniformity and quality of the resulting object."(Schekkerman 2006: 2).

Service Oriented Architecture (SOA)

Service Architecture, SOA, Event Driven Architecture and many other architectural concepts are currently used in technology. Although the accepted view is that Services are a technology solution to add agility, experience has proven that technology solutions rarely deliver agility except when they are focused on the business visions (Jones & Morris, 2005). There are numerous definitions of SOA. For the purpose of this paper where the focus is on SOA that is a business tool,

allowing business to architect their processes independent of each other, thus driving the other architectural domains to follow the same principal, the following definition was used:

> "Service Orientated Architecture (SOA) is a conceptual business architecture where business functionality, or application logic, is made available to SOA users, or consumers, as shared, reusable services on an IT network. Services in an SOA are modules of business or application functionality with exposed interfaces, and are invoked by messages" (Marks & Bell, 2006:1).

In order to fully understand the concept of SOA we separate each of the terms that make up the concept, namely: *Service* and *Architecture*. The term *orientation* refers to designing architecture as a service, and is therefore not defined separately. The objective of a *service* is to represent what the business does and place a boundary which all parties, but predominately the business can agree on. It is this representation of the business that the creation of a Service Architecture must be focused; technology is a secondary element (Jones & Morris, 2005). The second part of the concept of SOA is the *architecture*, which is defined as: "Architecture is the structure of the system, comprised of components or building blocks, the external visible properties of those components, and the relationships among them." (Bass, Clements & Kazman, 2003:21). It can be deduced from the definition of the two terms, service and architecture, that SOA is the process of representing what the business does in the context of the structure of the systems.

The Relationship between SOA and EA

EA and SOA seem to be from two separate worlds (Linthicum 2007). A lack of understanding of the relationship between SOA and EA has lead to few organisations reaping the combined benefit(Kistasamy, Van der Merwe et al. 2010). SOA and EA practitioners have also added the extra element of rivalry between disciplines, suggesting that one discipline is more important than the other (Harding 2007). The rivalry has created very little synergy between EA and SOA efforts, causing the organisations to suffer the consequences either of having projects delivered late or having to come in over project budget especially in EA or SOA implementations (Noran, Bernus & Meersman, 2008). Some traditional enterprise architects have not done a stellar job in understanding the opportunities within SOA and the SOA practitioners have not completely understood how SOA integrates with existing EA standards, notions, and practices (Linthicum 2007). EA supplies answers that encompass organization-wide processes, how they are aligned with corporate strategies and how processes are linked to performance measures whereas SOA offers customer-responsive IT solutions and inter-functional coordination of information flows and a robust platform upon which the business can apply their applications (Rohan 2008). EA and SOA can co-exist based on Rohan's definition, where both are equally significant in ensuring the technology solutions provided are supportive of the business processes. It is possible to argue that both have a clear role to play in achieving business and IT alignment thus alleviating any confusion; however this is not easily done due to the similarities between the two concepts. Figure 1 provides a view of a model on how SOA can enable EA, based on the work of Linthicum (2007)(Linthicum, 2007). The key elements from this model are the inputs from a business perspective as well as the inputs from an IT perspective, where the business strategy together with the executive management team drives the implementation.

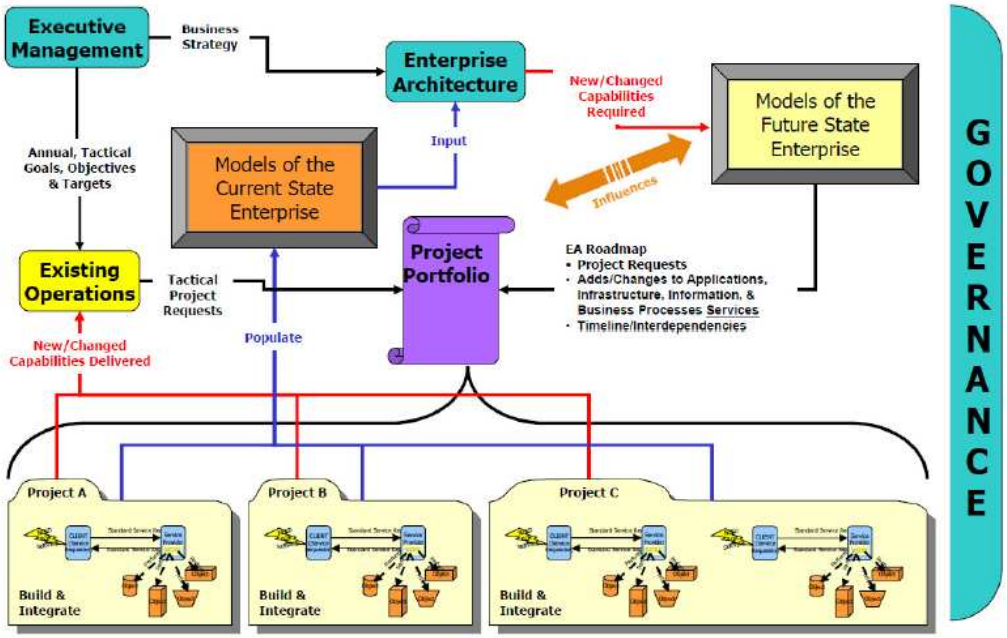

Figure 1: Integrated SOA and EA (Linthicum 2007)

Figure 1 depicts the inputs and outputs when integrating EA and SOA. There is a drive from *executive management (indicated in blue)* based on their vision, which has a direct impact on *existing operations (indicated in yellow)*, as it is in this area that new or changed capabilities will be introduced. The EA has a direct relationship with the business strategy from an input perspective as well as executive management from an ownership perspective, highlighting the business impact on the relationship between SOA and EA. The SOA projects that have been initiated as illustrated in Figure 1 (Project A, B and C) can directly be linked back to the business strategy and EA, thus highlight the link between SOA and EA, and the potential business benefit that can be achieved by governing the relationship of SOA and EA. The projects that have been highlighted will produce the new / changed capabilities or services, from a SOA perspective, that will meet the Enterprise Architecture requirements.

RESEARCH DESIGN

The epistemology for this research was an interpretive philosophy that focused on deriving guidelines for using SOA with EA. Orlikowski and Baroudi (1991:5) state that "Interpretive studies assume that people create and associate their own subjective and intersubjective meanings as they interact with the world around them. Interpretive researchers thus attempt to understand phenomena through accessing the meanings participants assign to them." The research approach used in this research was a qualitative inductive approach where the guidelines were derived from a case study and the literature. Maxwell and Kaplan (2005) provide support for this approach stating that qualitative research methods are primarily inductive where hypotheses are developed during the research so as to take into account what is being learned about the setting and the people in it. Most of the aspects that are discussed in this research are relatively new and thus the research approach required an exploratory analysis of the data with the aim of finding the best suited guidelines in order for SOA to enable EA. According to Yin (2003), the case study approach is appropriate where the researcher's main aim is to draw a list of characteristics but not necessarily conclusions. The main aim of this research was to identify guidelines that could be used for the implementation of SOA in the context of EA, and thus the case study approach was used to identify the guidelines. In Figure 2 we illustrate how the guidelines were determined based on the input received from both the case study and the literature review.

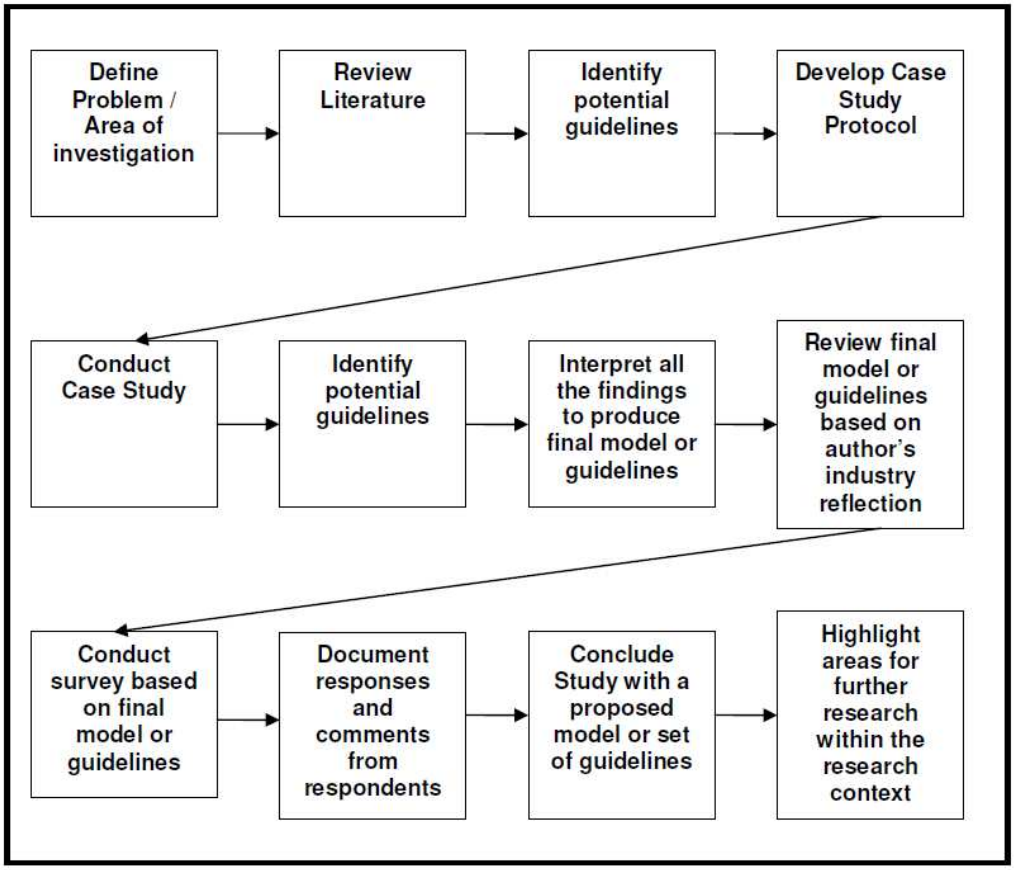

Figure 2: High Level Research Process (adapted from Gable 1994)

The relevant themes were derived based on the above mentioned data collection techniques, and thereafter the links between them were established. In terms of the data collection, a brief discussion of the methods that were used is highlighted below:

- A review of the literature was carried out in order to find links in the text to identify common themes that were shared across the expert community. These links were further extrapolated to determine the guidelines as set out in the research problem. This was done by summarizing the data collected into a summary document and then finding common themes, by looking at common words, phrases, or common ideas that were shared across multiple authors.

- A single case study was carried out at a large financial services organisation in the Western Cape, South Africa. The organisation had implemented SOA at a technology level and was in the process of implementing EA. Various individuals were interviewed at different levels of the organization in order to gather information on guidelines for using SOA to enable EA. The following roles were represented: All of the Group Architects (Group Head of Architecture, Group Business & Information Architect, Group Enterprise Architect, Group SOA Architect, Group Solutions Architect, Divisional CIO's, Divisional Enterprise Architects, and Divisional Business Architects).

- Once the final guidelines were determined, a survey was sent out to various industry practitioners to determine the feasibility of the guidelines in terms of their applicability to organisations today. Given the time constraints, the survey was sent out to 15 participants, of whom 9 responded, and the majority was in support of the guidelines in their current form, resulting in no impact to the guidelines.

GUIDELINES DERIVED FROM THE RESEARCH

Ten guidelines were derived from the literature analysis as well as the data collection within a large financial service organization. The guidelines included key activities such as *understanding the concepts* and the notion that *business must drive SOA* in order for the initiative to be successful. In Table 1 below, a summary of the guidelines are given with the source highlighted where the guideline was initially from.

Table 1: Summary of the Guidelines

	Guideline	Description	Source
1	Understand the Concepts	Define EA and SOA specific to the organisation.	Case Study
2	Always highlight the business value	Define the business value of SOA, in the context of the organisation.	Case Study
3	Business should drive SOA	Ensure proper executive support and mandate is established for a SOA initiative.	Case Study
4	SOA and EA should be viewed as complimentary	SOA and EA should not be implemented in isolation, as they support each other.	Case Study
5	SOA is not technology	The core focus of SOA is not a Technology. It is used to define technology capabilities.	Case Study
6	Terminology is key	Use terminology that is relevant to the organisation and that is understood by the stakeholders.	Case Study
7	Define the scope	Don't over promise and under deliver. Rather reduce the scope and ensure success.	Case Study
8	Define the deliverables	Define all of the artifacts that will be delivered by SOA and EA.	Literature
9	Define roles and responsibilities	There must be no ambiguity between roles and responsibilities. It should be clear and geared for delivery.	Literature
10	Provide formal mandate for EA and SOA	SOA and EA require firm mandate supported by the executive in order to deal with change inhibitors.	Literature

Guideline 1: Understand the concepts - The first guideline prescribes that it is necessary to understand that EA defines an organisation and SOA enables that definition through the enablement of capabilities for the organisation, that are re-usable, flexible and agile. The purpose of this guideline is to ensure that oganisations understand the scope of both EA and SOA. In defining an organisation, EA will focus on both the business and technology aspects, including the target operating model, business capababilities, functions, and processes, as well as IT capabilities that are required to enable the business. SOA will then focus on enabling the capabilities that have been defined by EA.

Guideline 2: Always highlight the business value - Guideline 2 emphasizes that although SOA can be considered both a business and technology concept, there needs to always be a link back to business that must be practically displayed whatever the context. The ultimate aim of SOA is to enable the business, and this needs to be clearly communicated in every SOA implementation through practical means. The business is not concerned with SOA as a concept, but they are very interested in the creation of business value and reduction of costs though any means possible. If SOA is able to provide tangible business benefit that is in line with the business objectives, the business will be motivated to provide more investment in SOA.

Guideline 3: Business should drive SOA - Guideline 3 prescribes that SOA initiatives must be driven from a business perspective (executive buy-in, financial buy-in, business by-in) in order to see real business benefit. IT cannot drive a SOA implementation, as this then becomes simply a technical implementation that does not have business buy-in. The driver of

SOA must be a business imperative that is stipulated by business, which should then translate into a formal mandate (including budget and executive support) for IT to deliver upon. In order for organisations to benefit from SOA, in terms of reuse, flexibility, and agility, the business needs to provide the overarching governance framework that deals with areas of non-compliance, such as unwilling business units. If SOA is driven by IT, business areas that do not co-operate will not be held accountable due to the fact that IT does not have the business mandate to dictate the value of SOA.

Guideline 4: SOA and EA should be viewed as complimentary - Guideline 4 states that SOA and EA should not be seen or implemented in isolation to each other since they both have the same objective to deliver tangible value to the business. An EA programme that is being implemented should incorporate SOA as part of its enablement or implementation capability. As mentioned in guideline 1, EA will ultimately assist business in documenting and defining their business capabilities as well as the IT capabilities that are needed to support the business strategy. SOA provides the means with which to bring these capabilities to life, however organisations that conduct SOA and EA projects in isolation are not able to clearly link the enablement aspect to the definition aspects, and many times we find that the enablement or implementation of SOA does not align to the business capabilities that have been defined. SOA and EA are complimentary and by embracing this thinking business will able to see the complete breakdown of their business strategy into their IT Strategy, as well as the practical output that SOA will be able to deliver in this context.

Guideline 5: SOA is not technology - *G*uideline 5 states that organisations should not think about SOA as technology and rather think about it as a methodology for driving out capabilities. Many projects that utilize SOA immediately look at technologies for integration and this often clouds the actual purpose of SOA, especially from a business perspective. The aim of SOA is to provide a means for delivering both business and IT capabilities that have been informed by the business. The technology component is a but one of the many considerations that will need to be addressed by SOA, however SOA in itself is not technology, but rather a means for delivering technology services that are required and informed by the capabilities that have been defined.

Guideline 6: Terminology is key -Guideline 6 emphasizes the use of terminology that is relevant to the organisation that business understands, and can relate to, even if it means not using the terms SOA and EA. The research that was conducted highlighted the fact that business seldom understands the terms EA and SOA, causing even greater resistance to the value that these concepts actually create. In order to garner support for both EA and SOA, it is recommended to utilize business terminology that the organisation understands. In this context, EA might for example be referred to as the alignment of business and IT, and SOA might be referred to as the alignment of business and technology. EA and SOA programmes are sometimes not supported simply due to the fact that the business does not understand the terminology being used, and this barrier must be dealt with as early as possible.

*Guideline 7: Define the scope- G*uideline 7 recommends ensuring that the scope of EA and SOA initiatives are relevant in terms of business support and time to deliver. This must be agreed upfront with the sponsor along with the success criteria that the solutions will be measured against. Organizations always have competing priorities, and although the needs are often endless, there is limited resources to address the needs. In terms of EA and SOA initiatives, it is recommended to define the scope in line with the business need that will be satisfied. This allows for a clear indication of what will be delivered, as well as the timelines for that delivery. As business needs are being satisfied through the use of EA and SOA, business becomes more confident in the approaches, and provides more resources for more delivery. This is an iterative cycle that leads to both the success and increased adoption of SOA and EA. It is recommended to rather start small and deliver well, as opposed to having a large scope without successful delivery.

Guideline 8: Define the deliverables -Guideline 8 recommends defining what architecture artifacts SOA will deliver as well as those that EA will deliver, to avoid duplication. SOA and EA are complimentary, and thus should support each other in addressing the business needs. This is done by defining the artifacts that will be delivered in the initial stages of the project, and ensuring that this framework is adhered to. In the event of the artifacts not being defined upfront, there is a possibility of duplicate effort being spent by the project team on the same artifacts, creating confusion as well as a negative view of SOA and EA.

Guideline 9: Define roles and responsibilities - Guideline 9 prescribes that roles and responsibilities need to be defined for both SOA roles and EA roles, so as to ensure that both teams are working towards the same objectives especially with regards to linking business and IT. In order for EA and SOA to succeed, the project teams and architects need to support and complement each other in achieving the business objectives. Traditionally there has been confusion with regards to EA roles and SOA roles; however this can be attributed to the fact that the relationship between EA and SOA was not initially defined. SOA provides a means to enable EA, and thus should received input from EA artifacts and architects; however this does not imply that EA is more important than SOA, but rather that EA can enabled by SOA, through a collaborative approach between the areas.

Guideline 10: Provide formal mandate for EA and SOA - Guideline 10 recommends defining what SOA and EA are specific to the organisation as well as what each will deliver to the organisation. This should be enshrined as a group wide business and IT principle against which SOA and EA endeavors are measured. The definition of SOA and EA in each organisation should give rise to formal principles that govern the use of SOA and EA within organisations. There would be different levels of principles defined for different contexts, but all of these should receive input from the organisational view of SOA and EA. Both EA and SOA require strong governance, as they provide a means for organisational change, which can have adverse impacts if not managed properly, and thus by creating principles, a formal mechanism is provided to govern these aspects. The creation of these principles also highlights the business mandate which can be used as means for organisational transformation, especially in areas where there is resistance.

The guidelines provide a means to assist organisations in ensuring that the necessary checkpoints are available when they embark on SOA and EA projects.

REFLECTION

The relationship between SOA and EA has been viewed traditionally from an IT perspective rather than looking at the value that could be added by focusing on the business aspects of the relationship. The guidelines that were suggested in this research definitely addresses the key issue of understanding of the concepts in the context of the specific organisation as well as ensuring that both SOA and EA are driven from a business perspective. The issue of unclear terminology has also been addressed through the guidelines. Both the literature and the case study indicate that SOA can enable EA, but in order to capitalize on the benefits of this relationship, there needs to be guidelines to facilitate the use of SOA and EA. The guidelines that were documented in this research provide a mechanism for architects and organisations to start their SOA and EA initiatives with some level of direction. Another key aspect that was pertinent in this research was the aspect of roles and responsibilities. Experience has taught us that especially with regards to SOA and EA, unclear roles and responsibilities can be detrimental to the project. Even if SOA and EA architects sit in different areas of the business they need to be driving the same objectives. Figure 3 highlights the fact that there are architecture decisions that need to be made at all levels of an organisation, and this needs to be defined to ensure there is no confusion when decisions need to be made.

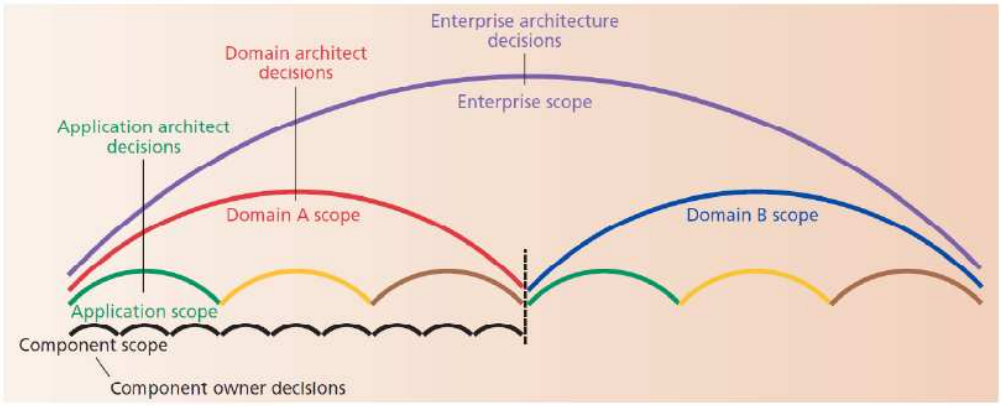

Figure 3: Architecture Levels of Scope (Malan & Bredemeyer, 2002)

The guidelines documented in this research highlight that there are roles and responsibilities for both EA and SOA. The most important aspect that organisations need to embrace is the fact that the relationship between SOA and EA can add value to an organisation in aligning business and IT to ensure value is provided to the customers.

CONCLUSION

This research has highlighted the relationship between SOA and EA, as well as how the embracing of this relationship could assist organisations in their endeavors to align business and IT from many perspectives, including financial, strategic alignment, as well as business value. The guidelines that were derived during this research are based on the input from the literature and the case study analysis, highlighting some the pitfalls that currently exist within organisations. However in order to generalize the results, more case studies are needed that confirm the guidelines found in this research. This research is relevant to both the academic body of knowledge and the industry practitioners' body of knowledge, as it provides a means

to criticize or enhance the findings and also highlights opportunities for further research into the relationship between SOA and EA.

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