Exploring Enterprise Architecture for Improved Business and Information Technology Alignment

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Business and information technology (IT) alignment remains a topic of interest among researchers due to the benefits associated with alignment. Enterprise architecture (EA) is an emerging discipline with business and IT alignment as one of the most important benefits. Enterprise architecture framework acts as a guidebook for building and maintaining the EA. The problem addressed within the study was the deficiency of EA frameworks to offer value towards improved business and IT alignment. Business and IT alignment can be considered as a problem, and EA can be considered as a tool to solve the problem of business and IT alignment using an EA framework as a structured approach to the solution. A qualitative case study design was selected for the study. An information rich EA framework (The Open Group Architecture Framework or TOGAF) was selected as the unit of analysis. The data collection method was based on archival documentation data (documents explaining TOGAF) which provided data from the developers of TOGAF. Analysis of TOGAF resulted in findings of four types of linkages. A total of 73 linkages were discovered in TOGAF contributing towards business and IT alignment. The four types of 73 linkages discovered in TOGAF were categorized into five broad categories. The findings of the study indicate the main properties for alignment are stakeholder management, business outcomes, plans, readiness and business requirements. Further research areas include a similar qualitative study on another standard EA framework and the applicability of five categories discovered in the study towards improving business and IT alignment.

1. Introduction

Business and information technology (IT) alignment remains a topic of interest among researchers due to the benefits associated with business and IT alignment (Cumps, Viaene, & Dedene, 2006; Luftman & Rajkumark, 2007). Enterprise architecture (EA) is an emerging discipline with several benefits (Christiansen & Gøtze, 2006; Infosys' Enterprise Architecture Survey, 2007; Schekkerman, 2005). One of the major benefits of establishing the EA is better business and IT alignment (Office of Management and Budget, 2007; The Open Group, 2009). Enterprise architecture framework acts as a guidebook for building and maintaining the EA. Several EA frameworks have been developed for guiding EA development. One of the most popular and widely used EA frameworks is The Open Group Architecture Framework (TOGAF) (Infosys' Enterprise Architecture Survey, 2007). Exploring TOGAF for improved business and IT alignment was a significant research contribution in the field of EA and would help architects to use EA in a better way for aligning the business with IT. The section includes the statement of the problem, the purpose of the study, the theoretical framework, and the significance of the study.

1.1 Background

Enterprise architecture is an emerging discipline of interest both for researchers and practitioners (Christiansen & Gøtze, 2006; Infosys' Enterprise Architecture Survey, 2007;
Schekkerman, 2005). Although, the roots of the EA discipline are traced to John Zachman’s article “A framework for information systems architecture” published in IBM Systems Journal (Zachman, 1987), most of the later EA work was done by EA practitioners. Enterprise architecture is purported to help in business and IT alignment (Office of Management and Budget, 2007; The Open Group, 2009) which is another discipline under investigation by both researchers and practitioners for over two decades and is among the top concerns for company executives (Lindstrom, Johnson, Johansson, Ekstedt, & Simonsson, 2006; Luftman, Kempaiah, & Nash, 2005).

Gregor et al. (2007) have analyzed a custom EA framework for enabling alignment using a qualitative approach and have indicated the need for further research on standard EA frameworks for enabling alignment. In the study, a custom EA framework is distinguished from a standard EA framework. A custom EA framework is either a framework developed specifically for an organization or a customized standard framework to satisfy specific requirements of an organization. The information about standard EA frameworks is normally available publicly. The study involved exploration of a standard EA framework for the specified problem. No studies were reported in literature similar to the study where a standard and widely used EA framework was explored for improved business and IT alignment (Gregor, Hart, & Martin, 2007).

1.2 Problem Statement

Enterprise architecture intended benefits include the alignment of information systems with the business goals (Office of Management and Budget, 2007; The Open Group, 2009) and, hence, the EA framework not only acts as a guidebook for building and maintaining the EA, but it is also critical for achieving the business and IT alignment through EA. The problem addressed within the study was the deficiency of EA frameworks to offer value towards improved business and IT alignment (Gregor et al., 2007).

Managers can use EA to align business and IT; however, different EA frameworks offer varying degree of guidance in aligning business and IT (Sessions, 2007). According to the Infosys’ Enterprise Architecture Survey (2007), 62% of the EA team members stated the need to spend time and effort to customize the existing EA frameworks for their requirements. Existing EA frameworks have deficiencies in providing intended EA benefits including business and IT alignment (Infosys’ Enterprise Architecture Survey, 2007; Peyret, Mendel, Ramsay, & Nagel, 2006). Business and IT alignment is the second most cited objective of EA (Infosys’ Enterprise Architecture Survey, 2007). According to a Meta Group survey of enterprise architects, 21% of the survey participants mentioned the primary reason for investment in EA is to improve business and IT alignment (as cited in Gregor et al., 2007).

1.3 Purpose

The purpose of the qualitative case study was to conduct an in-depth exploration of the value the selected EA framework (TOGAF) provides in aligning business and IT and to present potential recommendations for an improved EA framework for business and IT alignment. The TOGAF was selected as the unit of analysis for the qualitative case study (Yin, 2009). The selection of TOGAF was based on purposeful sampling in qualitative studies (Patton, 2002). The TOGAF is an information rich case and helped in illuminating the research questions under study. The TOGAF is being used throughout the world
(Infosys' Enterprise Architecture Survey, 2007) and thus the significance of the study was not bound to any particular geographic location. No human participants were involved for data collection; rather, data collection method was based on archival documentation data (documents explaining TOGAF) which provided data from the developers of TOGAF.

1.5 Significance of the Study

A study of an EA framework towards improved business and IT alignment was important for several reasons. First, the researchers would get a scholarly perspective on improving an EA framework for improved business and IT alignment. The study involved new analysis of TOGAF documentation for improved business and IT alignment. There were no reported studies in the literature that provided similar analysis of a standard EA framework such as TOGAF (Gregor et al., 2007). The potential of a standard EA framework such as TOGAF towards aligning business and IT was not explored in any other study. Second, the benefits of research in one field (business and IT alignment) were linked to another field (EA). Third, practitioners could utilize the results of study for improved business and IT alignment while developing the EA for an organization using TOGAF. The results of the study could potentially be the basis of similar research on other popular EA frameworks. Thus, the results of the study are a significant contribution to scholarly research and literature, and advancing the practice in the related fields.

2. Literature Review

The purpose of the qualitative case study was to conduct an in-depth exploration of the value the selected EA framework (TOGAF) provides in aligning business and IT and to present potential recommendations for an improved EA framework for business and IT alignment. Thus, the literature review section is organized around three topics, namely, enterprise architecture, business and IT alignment and enterprise architecture frameworks. Each topic is discussed in its own sub-section.

2.1 Enterprise Architecture

The main objective of the section is to develop a clear understanding of what an EA is and what are its benefits in the context of the study. Enterprise architecture is about better understanding of the seemingly disparate activities and elements required of an organization in a holistic manner for informed decision making at all levels of the organization (Infosys' Enterprise Architecture Survey, 2007; Jonkers et al., 2006). Enterprise architecture consists of business architecture, application architecture, data architecture, and technology architecture (The Open Group, 2009). The last three architectures are sometimes collectively called IT architecture. Thus, the EA consists of the business architecture and the IT architecture. The business architecture is defined as consisting of business domains with assigned activities, business functions and business concepts that the business domains need, and the high-level business processes that illustrate the interaction between the business domains to achieve the organizational goals and strategies (Versteeg & Bouwman, 2006). It can be deduced from the above definition EA links the organizational goals, strategies, and high-level business processes to the IT systems built to support them. Consequently, one of the most important benefits of building and maintaining an EA is alignment of the business with IT (Cardwell, 2008; Chief Information Officer Council, 2001; Goethals et al., 2006; Office of Management and Budget, 2007; Schekkerman, 2009; Sessions, 2007; The Open Group, 2009). The implementation of EA leads to the capability to create and maintain a common vision of
the future clear to both the business and IT communities and thus driving continuous business and IT alignment (Cardwell, 2008). Enterprise architecture is an instrument in the communication among diverse groups and interests and provides a common ground for discussion and decision making (Jonkers et al., 2006).

Literature on EA is full of discussions on three main advantages of EA, namely, alignment, integration and agility. As discussed, the business and IT alignment is one of the most important benefits of EA. The three main advantages are related to the holistic nature of EA (Bernard, 2005; Gammelgard et al., 2007; Jonkers et al., 2006; Shah & Elkourdi, 2007). Business and IT alignment is one of the major points of interest in EA community and is normally achieved by making descriptions of the enterprise from the point of view of all those who are involved in the realization of the enterprise (Goethals et al., 2006). Similarly, integration is achieved by taking an enterprise-wide point of view and developing cross-component relationships via enterprise-wide architecture descriptions (Goethals et al., 2006). Likewise, agility in change management is made possible due to enterprise-wide architecture descriptions; since, a known, understandable and properly documented entity is easier to change. In the context of agility in change management, the enterprise-wide architecture descriptions are helpful in handling complexity as the architecture descriptions are abstracted models of enterprise components that enable decision makers to see only the relevant information. With a view of developing a better understanding of EA, consider the following definition of EA:

> Architecture at the level of an entire organization is commonly referred to as “enterprise architecture” (EA). It is a coherent whole of principles, methods and models that are used in the design and realization of the enterprise’s organizational structure, business processes, information systems, and infrastructure. EA captures the essentials of the business, IT and its evolution. (Jonkers et al., 2006, p. 64)

The important point to note in the above definition is the depiction of only essentials in an EA. Another point to note in the definition is the role of EA in the evolution of business and IT architectures. Accordingly, enterprise architect captures not only the current architecture of the organization, but also the future architecture of the organization along with a plan to take the organization from its current state to the desired future state. The documentation of the two architectures in the EA repository enables the enterprise architects of an organization to perform gap analysis and come up with a strategic plan for execution. The relationships between architectural elements are at the heart of EA to provide an integrated view of the whole enterprise.

### 2.2 Business and IT Alignment

The main objective of the section is to present a review of the related literature and results of studies in the field of business and IT alignment. Different points of views on how to achieve the business and IT alignment are discussed along with some critical analysis. The review of business and IT alignment literature helped to explore the selected EA framework for improved business and IT alignment. The results of the study brought the benefits of the fields of EA and business and IT alignment together.

Information technology is a vital infrastructure of any organization, the backbone for information flow across the organization and the enabler of business processes (Huang & Qing, 2007). Both IT and business leaders constantly investigate for management practices and approaches to keep the IT and business strategies aligned (Sledgianowski
The need for business and IT alignment appears to intensify due to dynamic business strategies and continuously evolving technologies. Business and IT alignment is a complex and multidimensional problem that is a combination of processes, structures, plans, and decisions and remains among the top 10 issues for many organizations (Cumps et al., 2006). Business and IT alignment requires dynamic design, management, and execution of the IT functions in line with the organizational goals and strategies.

A survey of 300 chief officers and other enterprise managers revealed the business and IT alignment tops the list of management concerns (Luftman, 2003). In a survey, the researchers of Computer Sciences Corporation (2005) reported the business and IT alignment is among the top-ranked issues of chief officers. Business and IT alignment is a top concern for both IT practitioners and company executives (Luftman et al., 2005). Developing and maintaining harmony among business and IT, assessing the maturity of alignment, and finding the impact of misalignment are subjects of study in both business and IT domains (Sledgianowski & Luftman, 2005; Sledgianowski, Luftman, & Reilly, 2006).

One of the most cited business and IT alignment maturity model is Strategic Alignment Maturity Framework (SAMF) (Luftman, 2000; Luftman, 2004). The SAMF is composed of six key areas for measuring business and IT alignment maturity while considering the alignment as a process. The six key areas are: communication, competency and value measurement, governance, partnership, scope and architecture, and skills. Several instruments based on SAMF exist for measuring business and IT alignment in an organization (Khaiata & Zualkernan, 2009; Sledgianowski & Luftman, 2005; Sledgianowski et al., 2006).

2.3 Enterprise Architecture Frameworks

Most architects of large organizations can easily get overwhelmed by the sheer amount of effort and information to be maintained in the development of EA. Enterprise architecture frameworks offer a standard approach to architecture by providing a model for architectural descriptions and a method to produce them (Greefhorst, Koning, & Vliet, 2006). Enterprise architecture frameworks provide scoping, level of detail and ordering of architecture results along with insight into the relationships between architectural results for traceability of decisions and the impact of decisions (Land, Proper, Waage, Cloo, & Steghuis, 2009).

The EA frameworks are helpful in two main areas for organizations to build EA. First, they provide a systematic approach to the development of EA, and, second, they provide a categorization scheme for the huge amount of information that is to be maintained in the EA repository (The Open Group, 2009). As a result, EA frameworks can help in business and IT alignment both in the process of building EA as well as in defining links between
the architecture artifacts in the EA repository. Gregor et al. (2007) concluded when business and IT systems are drawn together under a common framework, the stakeholders get the ability to see how different parts of the organization fit together, and the gap analysis of the current and future states of the organization provides a basis for the strategic, operational, and resource planning. EA frameworks have an important role in aligning the business with IT (Gregor et al., 2007). Sage (2006) carried out research on the business and IT alignment as enabled by the EA development in governments. Sage indicated a lack of research basis in EA. Gregor et al. (2007) analyzed a custom EA framework for enabling alignment using a qualitative approach and indicated the need for further research on standard EA frameworks for enabling alignment. Several EA frameworks have been developed to assist in the development of EA (Chief Information Officer Council, 1999; Goedvolk, Bruin, & Rijsenbrij, 1999; James, Handler, Lapkin, & Gall, 2005; Schekkerman, 2009; The Open Group, 2009; Zachman, 1987).

3. The Methodology and Model

A qualitative case study design was selected for the study. An information rich EA framework (The Open Group Architecture Framework or TOGAF) was selected as the unit of analysis. The data collection method was based on archival documentation data (documents explaining TOGAF) which provided data from the developers of TOGAF. In the context of the research problem and to achieve the purpose of the study, some research questions were developed that were consistent with the emerging methodology of qualitative research.

The central research question of the study was: What value does the selected EA framework provides in aligning the business and IT? Based on the central research question, the following research sub-questions were developed for the qualitative study:

Q1. What are the existing linkages in the selected EA framework for business and IT alignment?
Q2. What are the deficiencies in the linkages in the selected EA framework for business and IT alignment?
Q3. How can the selected EA framework be improved for business and IT alignment by addressing the identified deficiencies?

The TOGAF was selected as the unit of analysis for the qualitative case study. The TOGAF is an information rich case and helped in illuminating the research questions under study (Patton, 2002). Creswell’s (2009) six step generic process for qualitative data analysis was followed for data analysis in the study. The six steps of Creswell’s [3] generic process are (a) organizing and preparing data for analysis, (b) preliminary analysis or making general sense of the data, (c) coding or categorization and labeling of data, (d) creating description of categories to generate small number of themes, (e) use of tables or drawings or process models to represent themes, and (f) making interpretation and meaning of data.

Creswell’s (2009) coding guidelines were used as part of the data analysis steps in the study. The coding guidelines provided by Creswell are (a) develop a sense of the whole data, (b) get to the underlying meaning of the document and not just its substance, (c) form a list of topics and group similar topics together into categories, (d) label the data with topic codes to help emergence of new categories and new topics, (e) develop interrelationships between categories, (f) finalize and arrange codes, (g) perform
preliminary analysis on the categories, and (h) recode the existing data as necessary. The coding guidelines were used in data analysis and discussed further in section 4.

The six step data analysis process and coding guidelines helped in systematic analysis of data and contributed to the quality of research. The six step data analysis process was used mainly for first research sub-question. Researcher’s knowledge and experience were important factors in the findings of the other research questions. Triangulation strengthens a study by combining methods or data (Patton, 2002). The main source of data was TOGAF documentation, but researcher’s perspective based on knowledge and experience in the area of research, and other researchers’ perspective acquired from the literature on EA, EA frameworks, and business and IT alignment, lead to data triangulation.

4. The Findings

The purpose of the qualitative case study was to conduct an in-depth exploration of the value the selected EA framework (TOGAF) provides in aligning business and IT and to present potential recommendations for an improved EA framework for business and IT alignment. The section includes a description of findings of the qualitative study in the context of the research questions.

Enterprise architecture is a conceptual tool assisting architects to understand the complex structure and workings of an organization (Platt, 2002). One of the major benefits of establishing the EA is better business and IT alignment (Office of Management and Budget, 2007; The Open Group, 2009). Enterprise architecture framework acts as a guidebook for building and maintaining the EA. Relationships or linkages between artifacts used in describing the architecture are central in EA discipline.

During data analysis, the point of interest was to discover the linkages within TOGAF version 9 contributing to business and IT alignment. The discovery of these linkages followed the process of data analysis and coding guidelines outlined in section 3. Three types of linkages or relationships were discovered during data analysis. A comprehensive coding scheme was devised to identify each linkage uniquely. The coding scheme is gradually revealed as the linkages found in TOGAF for business and IT alignment are presented in the rest of the section. The order in which the discovered linkages are presented below also matches the level of increasing complexity associated with the discovery in terms of inductive reasoning involved. In general, the coding scheme consists of two parts. The prefix part identifies the type of linkage and a numerical suffix uniquely identifies a linkage belonging to the type. The prefix varies from a three alphabets code at minimum to a six character code at maximum. The complete representation of coding scheme used in the rest of the section is MMM{-S}{T}N{N}, where MMM represents the three alphabets main type, {-S} represents optional one alphabet subtype preceded by a hyphen (-), {T} represents optional one alphabet sub-subtype, and N{N} represents one or two digit unique number within each type. The curly braces in above representation of coding scheme represent optional parts. Some of the code examples are DCL5 (no sub-type), PDL-B1 (with sub-type) and PDL-CA2 (with subtype and sub-subtype).

The TOGAF has content meta-model to support consistency, completeness and traceability in defining the enterprise architecture in a repository (The Open Group, 2009). A meta-model is a model describing the entities and the relationships between them which
are used for describing the enterprise architecture in a structured way (The Open Group, 2009). Although the TOGAF content meta-model is described in a modular fashion, the full content meta-model is considered in analysis to satisfy the purpose of the study. The linkages or relationships for business and IT alignment that are deducible from the full content meta-model are termed as “core linkages” in the context of the study. The core linkages are categorized into “direct core linkages” (DCL) and “indirect core linkages” (ICL).

The TOGAF separates the enterprise architecture into four different architectures, namely, business, application, data and technology. The application, data and technology architectures are collectively referred to as IT architecture. Thus, there are two architectures of interest from the business and IT alignment point of view, namely, business architecture and IT architecture. The linkages between the business and IT architectures in the full content meta-model are the core linkages. The core linkages in the full content meta-model which directly link the business architecture with the IT architecture and hence contribute to business and IT alignment are DCLs. The core linkages in the full content meta-model which indirectly contribute to business and IT alignment are ICLs.

A systematic data analysis of the TOGAF full content meta-model revealed there are only three entities in the business architecture having linkages with the entities in the IT architecture:
1. Actor: A person, organization or system with a role to initiate or interact with activities (The Open Group, 2009).
2. Location: Specifies the location of IT assets and external consumers of service (The Open Group, 2009).
3. Business Service: Supports business capabilities via an interface and is governed by an organization (The Open Group, 2009).

The direct core linkages (DCLs) or relationships between the business and IT supported by the TOGAF full content meta-model are:
1. An actor consumes or supplies the data (DCL1).
2. A location contains physical data component, physical application component and physical technology component (DCL2).
3. Business service is realized through information systems service (DCL3).
4. Business service provides or consumes the data (DCL4).

There are implicit or indirect core linkages (ICLs) in the TOGAF full content meta-model for the business and IT alignment. The ICLs are indirect as they do not link the business architecture directly to the IT architecture, but rather through the business service entity discussed above. The ICLs are the linkages inside the business architecture meta-model, but indirectly contribute to business and IT alignment. Besides the actor entity which is already described above, the following three entities have linkages or relationships with the business service that contribute toward business and IT alignment:
1. Measure: An indicator or factor to establish alignment with objectives and goals (The Open Group, 2009).
2. Service quality: A preset configuration of attributes assigned to a service or service contract (The Open Group, 2009).
3. Contract: An agreement between a service consumer and a service provider to establish interaction parameters (The Open Group, 2009).
The analysis revealed the following indirect core linkages (ICLs) or relationships between the business and IT supported by the TOGAF full content meta-model:

1. Business service is tracked against the measure (ICL1).
2. Business service should meet the service quality (ICL2).
3. Business service is governed and measured by contract (ICL3).
4. Business service is provided to actor (ICL4).

Besides core linkages, TOGAF provides a number of other linkages for business and IT alignment that are not as clearly discoverable as the core linkages. In the context of the analysis in the study, these linkages are termed as process-driven linkages (PDLs) as they are mostly identified in the TOGAF Architecture Development Method (ADM) which is a method or a process for developing enterprise architecture. The PDLs are mostly action-oriented as they are a step of a process. The action helps align the business and IT. Sometimes PDLs are stated as a requirement to be met as a result of some action. The TOGAF provides some guidance for the action, but the framework is sometimes silent about providing any guidance as to what kind of action would satisfy the requirement.

The process-driven linkages (PDLs) are described in the context of how TOGAF ADM phases can possibly provide alignment between business and IT. Starting with the Preliminary (P) phase, the TOGAF ADM has eight phases (A, B, C, D, E, F, G and H) which form a continuous circle. All the phases from A to H are bi-directionally connected to Requirements Management (R).

The PDLs discovered in the TOGAF ADM for each of the phases during data analysis are presented below in the same sequence as they are supposed to be followed in ADM. Each PDL is uniquely identified by a code for further reference and discussion in the section. The following are the PDLs discovered in the Preliminary Phase (P) of TOGAF ADM (the P in the code after hyphen refers to the Preliminary Phase):

1. Identify key drivers and elements in the organizational context such as business directives, business imperatives, business strategies, business principles, business goals, and business drivers (PDL-P1).
2. Identify the constraints and assumptions in the organizational context (PDL-P2).
3. Identify key decision-makers and stakeholders and their key issues, requirements, priorities and concerns (PDL-P3).
4. Identify the outline enterprise business information requirements the IT needs to support (PDL-P4).
5. Establish architectural touch points with other management frameworks such as Business Planning, Operations Management, Portfolio/Project Management and Solution Development (PDL-P5).
6. Define architecture principles based upon business principles, business goals and strategic business drivers (PDL-P6).
7. Determine existing enterprise and business capability using one of the Capability Maturity Models (PDL-P7).

The following are the PDLs discovered in the Architecture Vision (Phase A) of TOGAF’s ADM (the A in the code after hyphen refers to the Architecture Vision Phase):

2. Verify and understand the business mission, vision, strategy and goals in order to align them with IT mission, vision, strategy and goals (PDL-A2).
3. Define the relevant stakeholders, and their concerns and objectives (PDL-A3).
4. Use stakeholder management techniques such as identification, categorization, analysis, and generation of stakeholder maps to identify appropriate response for each stakeholder group (PDL-A4).
5. Verify and gain buy-in to the key business objectives and processes that the architecture is to support (PDL-A5).
6. Identify a specific set of business drivers that represent the return on investment for the stakeholders (PDL-A6).
7. Define the key business requirements and the constraints by using the business scenarios technique to discover and document business requirements (PDL-A7).
8. Understand the capabilities and desires of the business, and then identify likely implications for the current IT capability to create an initial picture of new IT capability (PDL-A8).
9. Identify how the new capability as a result of the architecture work will meet the business goals and strategic objectives and address the stakeholder concerns when implemented (PDL-A9).
10. Assess readiness for business transformation to shape the scope and to identify the business transformation risks and mitigation activities (PDL-A10).
11. Define the performance metrics and measures to be built into the enterprise architecture to meet the business needs (PDL-A11).
12. Develop a communications plan for communication with stakeholders to show progress of the enterprise architecture developments (PDL-A12).

The following are the PDLs discovered in the Business Architecture (Phase B) of TOGAF’s ADM (the B in the code after hyphen refers to the Business Architecture Phase):

3. Analyze the gaps between Baseline and Target Business Architecture (PDL-B3).
4. Define business roadmap to prioritize future activities (PDL-B4)
5. Resolve impacts of target business architecture across architecture landscape including pre-existing architectures as well as planned and in-progress projects (PDL-B5).
6. Develop architecture viewpoints to address stakeholders concerns (PDL-B6).

The Phase C of TOGAF ADM has two parts, namely, Data Architecture (D) and Applications Architecture (A). The following are the PDLs discovered in the Information Systems Architecture – Data Architecture (Phase CD) of TOGAF’s ADM (the CD in the code after hyphen refers to the Information Systems Architecture – Data Architecture Phase):

1. Identify how data entities are utilized by business functions, processes, and services (PDL-CD1).
2. Identify data-related skills and roles the enterprise requires (PDL-CD2).
3. Develop Target Data Architecture to support Target Business Architecture using content meta-model (PDL-CD3).
4. Perform impact analysis to identify any area where the Business Architecture may need to change to cater for changes in the Data Architecture (PDL-CD4).
5. Conduct formal stakeholder review to ensure all stakeholders concerns are covered (PDL-CD5).
6. Conduct final cross-check of overall architecture against business requirements (PDL-CD6).

The following are the PDLs discovered in the Information Systems Architecture – Application Architecture (Phase CA) of TOGAF’s ADM (the CA in the code after hyphen refers to the Information Systems Architecture – Application Architecture Phase):

1. Map applications to business services using content meta-model to identify how the applications support the business (PDL-CA1).
2. Identify user and organizational dependencies on applications (PDL-CA2).
3. Develop Target Application Architecture to support Target Business Architecture using content meta-model (PDL-CA3).
4. Perform impact analysis to identify any area where the Business Architecture may need to change to cater for changes in the Application Architecture (PDL-CA4).
5. Conduct formal stakeholder review to ensure all stakeholders concerns are covered (PDL-CA5).
6. Conduct final cross-check of overall architecture against business requirements (PDL-CA6).

The following are the PDLs discovered in the Technology Architecture (Phase D) of TOGAF’s ADM (the D in the code after hyphen refers to the Technology Architecture Phase):

1. Consider the business requirements for technology (PDL-D1).
2. Map technology architecture entities to business and organizational entities and policies (PDL-D2).
3. Conduct formal stakeholder review to ensure all stakeholders concerns are covered (PDL-D3).
4. Conduct final cross-check of overall architecture against business requirements (PDL-D4).

The following are the PDLs discovered in the Opportunities and Solutions (Phase E) of TOGAF’s ADM (the E in the code after hyphen refers to the Opportunities and Solutions Phase):

1. Consolidate gaps from phases B to D and address target business objectives and capabilities (PDL-E1).
2. Determine key corporate change attributes such as culture and enterprise personnel skill sets (PDL-E2).
3. Determine business constraints for implementation of architecture (PDL-E3).
4. Consider business interoperability issues to align them with available solutions and technology, if possible (PDL-E4).
5. Refine and validate business dependencies such as professional development and training, infrastructure for housing new business capability, processes enabling business to use IT capability, policies and government regulations affecting IT (PDL-E5).
6. Assess enterprise business transformation readiness and capture associated risks (PDL-E6).
7. Assess the business transformation-related activities and group them into projects for efficient execution (PDL-E7).
8. Derive a series of Transition Architectures to deliver continuous business value in support of corporate business objectives (PDL-E8).
The following are the PDLs discovered in the Migration Planning (Phase F) of TOGAF’s ADM (the F in the code after hyphen refers to the Migration Planning Phase):

1. Coordinate and align migration planning with other management frameworks, namely, Business Planning, Portfolio/Project Management and Operations Management (PDL-F1).
2. Assign business value to each project and establish a concrete set of criteria to assess business value and measures to calculate objectives achievement for the project (PDL-F2).
3. Prioritize migration projects via cost/benefit analysis and risk validation using key business drivers and stakeholder concerns as prioritization criteria resulting in business success-aware list of projects to support quick business outcomes (PDL-F3).

The following is the PDL discovered in the Implementation Governance (Phase G) of TOGAF’s ADM (the G in the code after hyphen refers to the Implementation Governance Phase):

1. Ensure conformance of the deployed solution with the Target Business Architecture (PDL-G1).

The following are the PDLs discovered in the Architecture Change Management (Phase H) of TOGAF’s ADM (the H in the code after hyphen refers to the Architecture Change Management Phase):

1. Monitor business drivers for architecture change such as business-as-usual developments, business exceptions, business innovations, business technology innovations, and strategic change which may result in complete redevelopment of architecture (PDL-H1).
2. Assess change requests to ensure the architecture achieves its original target business value (PDL-H2).

The following are the PDLs discovered in the Architecture Requirements Management (R) of TOGAF’s ADM (the R in the code after hyphen refers to the Architecture Requirements Management):

1. Confirm stakeholder buy-in to business requirements and assigned priorities (PDL-R1).
2. Identify changed business requirements and confirm stakeholder agreement with the assigned priorities (PDL-R2).
3. Ensure any conflicts related to changed requirements are identified and managed (PDL-R3).

The TOGAF provides some recommended tools and techniques to complement the steps in various phases of ADM. The tools and techniques also contribute to business and IT alignment. The linkages for business and IT alignment achieved through the tools and techniques are termed as tools and techniques driven linkages (TDLs). The phases of TOGAF ADM use several tools and techniques. The TDLs is a subset of these tools and techniques which are identified as helping in business and IT alignment. The following are TDLs discovered in TOGAF to support business and IT alignment:

1. Stakeholder Management Technique (TDL1).
2. Business Scenarios Technique for deriving business requirements for enterprise architecture (TDL2).
5. Risk Management Technique to mitigate risk involved in architecture/business transformation effort (TDL5).
6. Capability-Based Planning Technique which frames all phases of ADM in the context of business outcomes, clearly linking IT efforts with corporate strategic, business, and line of business plans (TDL6).
7. Capability Maturity Model Tool for determining actual levels of maturity of the organization’s ability to change (TDL7).

The following discussion is a summary of findings of first research question. Analysis of TOGAF full content meta-model resulted in findings of two types of linkages for business and IT alignment, namely, Direct Core Linkages (DCLs) and Indirect Core Linkages (ICLs). Analysis of TOGAF ADM also resulted in two types of linkages for business and IT alignment, namely, Process Driven Linkages (PDLs) and Tools and Techniques Driven Linkages (TDLs). The DCLs provide direct alignment benefits. The ICLs, PDLs and TDLs provide indirect alignment benefits. These findings have discovered two groups of linkages. One group is derived from the analysis of TOGAF full content meta-model, and the other group is derived from the analysis of TOGAF ADM. One group consists of DCLs and ICLs, and the other group consists of PDLs and TDLs. The DCLs provide direct alignment benefits. The ICLs, PDLs and TDLs provide indirect alignment benefits. The two groups complement each other in providing business and IT alignment benefits. The group consisting of DCLs and ICLs is static and informational, whereas the group consisting of PDLs and TDLs is action oriented.

4.4 Evaluation of Findings

The section includes the evaluation of findings presented in the last section. The evaluation of findings is presented in the same sequence as the findings are presented in the last section. The evaluation of DCLs and ICLs are presented first. In the context of DCLs and ICLs, it is discussed how the linkages help align the business and IT, and what are the apparent benefits. The evaluation of PDLs and TDLs are presented next. As mentioned earlier, the two groups of linkages are complimentary to each other for business and IT alignment.

The following discussion pertains to the DCLs. The most important of the linkages is the business service linkage with the information system (IS) service (DCL3). In the light of business and IT alignment, “business and IS service relationships show where the business view aligns with the IS view, and where there are misalignments” (The Open Group, 2009, p. 383). The linkage DCL1 allows linking the data processed via information technology to the consumers and suppliers (actors), for example, to maintain integrity and confidentiality of data, but a similar linkage is also available through business service to the data (DCL4). A deeper analysis indicates the actor to data linkage takes care of situations where the data and business services are shared. The linkage DCL2 gives the business the ability to track IT assets.

The following discussion pertains to the ICLs. All of the indirect core linkages rely on the direct linkage between business service and IS service (DCL3). The linkage ICL1 allows the business service to be linked to the organizational objectives through the measure entity. Thus the organizational objectives are indirectly linked to IT. The linkage ICL2 allows a service level to be established between the business service and its consumers.
allowing the demands of the business (and its customers) to be met appropriately by IT. The linkage ICL3 allows the ability to apply contracts to business service (contracts should meet the service quality). The linkage ICL4 allows impact of any changes in IT to be tracked back to the consumer of the business service. Altogether, business drivers, goals and objectives of an organization can be traced to services levels provided or agreed for the business service. The ability to link business drivers to goals, goals to objectives, objectives to business service (via measure), and business service to IS services allows managers to highlight misalignment of priorities in the organization, for example, between cost reduction and capability increase (The Open Group, 2009). Competing demands for business services are also highlighted allowing managers to define compromised service levels.

In order to illustrate the contribution of PDLs and TDLs towards business and IT alignment, a set of categories of linkages is developed based on the intended meaning of the PDL or TDL. Categories development is in-line with the process of data analysis outlined in section 3. Taking the minimalistic approach, five distinct categories were identified. Each of the PDL and TDL was mapped to one category. The contribution of PDLs and TDLs towards business and IT alignment is then discussed in the context of the developed categories. The following are the five developed categories along with explanations:

1. Stakeholder Management: Identification of stakeholders, understanding their concerns and communicating with them is an important aspect of business and IT alignment. Several PDLs and TDLs are aimed at stakeholder management.
2. Business Outcomes: Alignment results in business outcomes and several PDLs/TDLs are aimed at demonstrating how IT activities result in business outcomes.
3. Plans: Business and IT plans should be aligned. Business vision, mission, goals and objectives should be aligned with IT vision, mission, goals and objectives. Several PDLs/TDLs have contribution in the alignment of plans.
4. Readiness: Business and IT can only be aligned when both have respective level of readiness. Many PDLs/TDLs are related to readiness assessment and risk management.
5. Business Requirements: Alignment occurs when IT personnel understand the business requirements and deliver the anticipated business outcomes.

Each of the PDL and TDL is mapped to one of the above categories to demonstrate their contribution in business and IT alignment. To get a complete view of the value the TOGAF provides towards business and IT alignment, the DCLs and ICLs were also mapped to the above categories. In cases, where a particular linkage can possibly be mapped to multiple categories, the more weighted category is assigned.

Categorization of linkages is a powerful tool for the evaluation of findings and application of findings to the results of reported studies in the field of business and IT alignment. The findings of the study indicate the main properties for alignment are stakeholder management, business outcomes, plans, readiness and business requirements. The analysis of TOGAF indicates the contribution of TOGAF to all five categories considered important for business and IT alignment.
5. Summary and Conclusions

Analysis of TOGAF resulted in findings of four types of linkages, namely, Direct Core Linkages (DCLs) and Indirect Core Linkages (ICLs), Process Driven Linkages (PDLs) and Tools and Techniques Driven Linkages (TDLs). The discovered linkages are a substantial proof of the value TOGAF provides in aligning business and IT. A total of 73 linkages were discovered in TOGAF contributing towards business and IT alignment. The four types of linkages discovered in TOGAF were categorized into five broad categories. The categories belong to areas considered important for business and IT alignment in the literature. The categories further validated the value TOGAF provides in aligning business and IT. The results of the study will have implications for both practitioners and researchers looking to find ways to align business and IT. The results not only highlight the value TOGAF provides in aligning business and IT, but also emphasize the importance of EA in a broader context as a tool for business and IT alignment.

Further research areas include a similar qualitative study on another standard EA framework and the applicability of five categories discovered in the study towards improving business and IT alignment. The study has several practical applications of the study supported by research findings. The teams within an organization aiming to use TOGAF primarily for business and IT alignment will benefit from the results of the study. The results of study highlight the parts of TOGAF that jointly contribute to business and IT alignment. The identification of all the linkages in TOGAF for business and IT alignment will be helpful for the teams planning to use TOGAF for business and IT alignment.

References


Luftman, JN and Rajkumark, K 2007, An update on business/alignment: A line has been drawn. MIS Quarterly Executive, Vol. 6, No. 3.