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Enterprise Architectures and Information Systems Alignment: policy, research and future implications

Nigel Martin
Australian National University

Shirley Gregor
Australian National University

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Nigel Martin

Shirley Gregor

School of Business and Information Management
Australian National University
Canberra, Australia
Nigel.Martin@defence.gov.au

Abstract

This paper discusses the alignment of the enterprise with its Information Systems (IS) from the perspective of policy determinations, past research studies and implications for the future. Policy determinations from the US, UK and Australia are discussed, while past and current alignment research studies are reviewed and contrasted. It is conjectured that where Enterprise Architecture (EA) treatment is not mandated, there may still be a positive role for architecture in the alignment of the enterprise and its IS. Some well known EA frameworks and methods are reviewed and compared as viable alignment vehicles. The paper concludes with implications for future alignment research studies and policy decisions, and outlines a current research program that is investigating the use of enterprise architecture in government agencies for the alignment of business strategy and IS.

Keywords

Alignment, Architecture, Enterprise, Policy, Systems

INTRODUCTION

The concept of aligning an enterprise with its Information Systems (IS) has been a cornerstone of strategic management for some period of time (Viljoen, 1996). Some studies have pointed directly to the improvement of enterprise financial and business performance through the implementation of a corporate and management framework (Rhyne, 1986). One of the key stated benefits of enterprise-IS alignment is to allow an enterprise to achieve its business mission and objectives.

The first section outlines the policy responses to the growing demands for information use and exchange in government circles, including the US government legislation for the enforced development of Information Technology (IT) Architectures and organisational alignment (Clinger-Cohen Act 1996). While the Australian government has not enacted legislation to enforce intra-governmental alignment and architecture, the National Office of the Information Economy (NOIE) is in the process of ratifying an interoperability framework (NOIE, 2002). This proposal follows a similar Electronic Government (e-Government) initiative by the British government that is targeting Whole of Government information exchange and management.

The second section reviews past research papers and studies in the area of alignment. These studies have developed various theories and models (Earl, 1989; Henderson and Venkatraman, 1993); investigated the social dimension of alignment (Reich and Benbasat, 1996; 2000); considered strategic information systems aspects (Chan and Huff, 1992); investigated the linkage with business performance outcomes (Chan *et al*., 1997; Croteau *et al*., 2001); and measured the perceived effectiveness of IS (Chan *et al*., 1997). This research tends to suggest that alignment has positive impacts on business performance and perceived IS effectiveness.

The third section posits a role for Enterprise Architecture in developing enterprise-IS alignment. In the quest for greater integration and alignment of enterprises, little research has been directed to the treatment (independent) variable, or how alignment is achieved. In past research, alignment has been the designated treatment, with outcome (dependent) variables that include business performance or IS effectiveness. The lack of research in this

area provides an opportunity to study the application of enterprise architectures in organisations in an attempt to establish their contribution to enterprise-IS alignment outcomes.

The concluding section considers the implications for policy makers and outlines a current research program that is investigating the use of enterprise architectures in government agencies. The objectives of the paper are to:

- Outline the policy determinations that shape alignment of the enterprise and its IS in a government context.
- Review and contrast past research studies on enterprise and IS alignment.
- Identify a role for architecture in establishing enterprise and IS alignment.
- Consider some of the implications for policy makers and outline a current enterprise architecture study.

IMPORTANT DEFINITIONS

There are four important definitions that must be explicated before the paper is further developed. The definitions are outlined as follows:

- *Alignment* – the functional linkage between enterprise strategy and enterprise IS that reflects the need to ensure internal coherence between enterprise strategies and the delivery capability of enterprise IS.

  (Croteau *et al*., 2001)

- *Architecture or Enterprise Architecture* – the logical structuring and classification of descriptive representations of an enterprise, which are 'significant' to the enterprise management and development functions (i.e., planning, leading, organising and controlling).

  (Zachman, 1996)

- *Interoperability* – the ability of two or more architectural systems or components to exchange information and to use the information that has been exchanged (NOIE, 2002). Implementation of an Enterprise Architecture should lead to improved enterprise-IS alignment, fit and information exchange.
- *Strategy* – the high-level management framework formed for the purposes of meeting the enterprise objectives (i.e., business, financial, environmental, etc.), and includes corporate goals, mission, plans and procedures.

  (Viljoen, 1996)

POLICY DETERMINATIONS

Policy and corporate governance at the upper levels of organisations direct the organisation's progress. Various governments and authoritative agencies have sought to bring about alignment and integration of information resources since the 1990s. In some cases, the actions have been direct and invasive taking the form of legislation. Other actions have been less prescriptive with suggested frameworks and plans of action.

US Clinger-Cohen Act 1996

In 1996, the US government took a far-reaching step and legislated an Act that mandates government agencies to establish IT architectures. The Clinger-Cohen Act (1996) enacts the following:

> *Chief Information Officers (CIO) are assigned the responsibility to develop information technology architectures (ITAs). The Office of Management and Budget (OMB) M-97-02, Funding Information Systems Investments, October 1996, requires that Agency investments in major information systems be consistent with Federal, Agency, and Bureau ITAs.*
>
> (FEAF Version 1.1 1999)

The CIO Council of the US government commenced development of the Federal Enterprise Architecture Framework (FEAF) in April 1998 and the FEAF was delivered for use in September 1999. In delivering the framework, the Chairs of the CIO Council stated:

> *The undersigned chairs do hereby endorse this Federal Enterprise Architecture Framework and consider it to be a road map for the Federal Government in achieving better alignment of technology solutions with business mission needs*
>
> (Lee and Flyzik, 1999)

The US government approach was designed to develop alignment and integration of information resources, improve investment decisions, and organise federal information at the top-most level.

UK eGIF

The British government has also developed a similar alignment framework taking the form of the United Kingdom electronic Government Interoperability Framework (UK eGIF). UK eGIF was developed and launched in October 2000 and is currently issued as Version 4 of the framework. The framework mandates technologies, standards, components and schemas for use by agencies in the UK. An extract from the executive summary of the UK eGIF states the following:

> *The eGIF is a pragmatic strategy that aims to reduce cost and risk for government whilst aligning the government with the global Internet revolution.*
>
> (UK eGIF Version 4, 2002)

Again, the alignment and integration of information resources is a common theme. However, the framework is a policy directive rather than a legislative instrument for the invocation of top-level information policy.

Australia GIF

The Australian government has had a succession of information resource initiatives. In 1995, the *Clients First* report (DOFA, 1995) identified the need for a cooperative, aligned, integrated and coordinated approach to the delivery of better and more efficient government services. Since that landmark report was issued, other key policy documents have included the Prime Minister's statement *Investing for Growth (*DIST, 1997), *A Strategic Framework for the Information Economy* (NOIE, 1998), and the April 2000 *Government Online* strategy (DOCITA, 2000).

In July 2001, the Online Council (made up of local, state and federal government agencies) agreed to support and work with NOIE to deliver and ratify the next stage of integrated services delivery (NOIE, 2002). Currently, the Australian Government Interoperability Framework (AusGIF) (NOIE, 2002) is in the process of ratification. The focus of Australian efforts on integration and alignment has taken the form of the AusGIF and the initiative of various government departments and agencies to build enterprise-wide architecture frameworks.

In summary, the major thrust of government policies and practice in the US, UK and Australia has been interoperability frameworks with only the US legislating for the creation of architecture that supports the development and ongoing sustainment of alignment and integration of government services. Hence, government agencies have been provided with an opportunity to use architecture treatments for establishing enterprise-IS alignment. Accordingly, it may be possible to study the different architectural practices in use and the related effects on alignment.

PAST ALIGNMENT RESEARCH

There is a significant body of research relating to the concept of alignment and strategic management. Table 1 shows a number of significant studies in the area of alignment.

Study	Study Topic	Study Significance/ Importance
Earl (1989) *Henderson and Venkatraman (1993)*	SIS Planning Theory Strategic Alignment Theory and Model	Developed baseline knowledge and initial models for further theoretical and empirical research.
Chan and Huff (1992)	Alignment IS Research Perspectives	In-depth issues ('primer') for conducting research: Concentration on similar enterprises in same business/ industry sector. Use case studies or historical research approach. Focus on strategy content and process. Use executive inputs and views. Use multi-level management analysis.
Reich and Benbasat (1996, 2000)	Social dimensions study of business-IS alignment	Developed measures for alignment. Assessed factors that impact or influence alignment.
Chan et al. (1997)	Business Strategy, IS Strategy alignment and resulting Business Performance	Large study using alignment as independent variable. 900 manufacturing, banking and insurance company Chief Executives surveyed. 19% survey response rate. Alignment of strategies support enhanced business performance.
Croteau et al. (2001)	Business Structures – Systems, IS alignment and resulting Business Performance	Large study using alignment as independent variable. 945 Manufacturing and finance company Chief Executives surveyed. 11% survey response rate. Alignment of structures and systems support enhanced business performance.

Table 1: Significant Alignment Research Studies

Alignment Theory and Modelling

Henderson and Venkatraman (1993) devised one of the landmark theoretical models for Strategic Alignment (Figure 1). Their Strategic Alignment model asserts that for strategic alignment to exist, internal and external fit must be present. The model's underlying theory indicates that the alignment of IS and business strategy requires close coordination of the business and IS constructs. The theory suggests that effecting a change in any single domain requires the use of three out of the four domains to assure both strategic fit and functional integration. In theory, the strongest construct drives change into weaker constructs and co-strengthens the adjoining domain (either business or IS). The external fit is achieved when IS and business strategies are coherently developed and congruent with the prevailing operating environment. Internal fit is achieved when IS and IS strategy is consistent with business structures and strategy. The theory advocates intimate business and strategy links, is business process driven, and focuses on enterprise-wide information management.

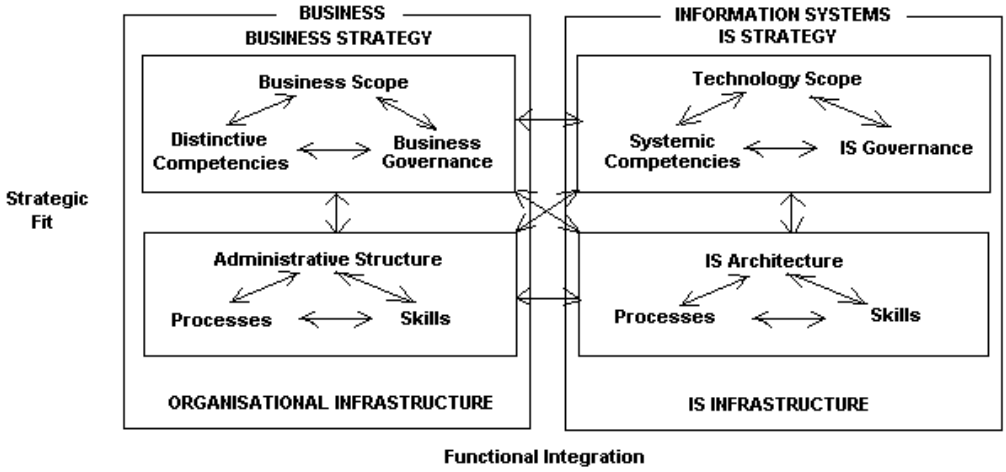

Figure 1: Strategic Alignment Model (Henderson and Venkatraman, 1993)

Earl (1989) followed a similar line of inquiry into Strategic Information Systems Planning (SISP) and posited that strategic investment needs to be properly integrated with IS functionality and business operations. Earl's theoretical model (Figure 2) incorporates alignment between business strategy, current IS and future IS opportunities in an integrated IS strategy. The two theoretical models are pivotal to understanding the alignment construct.

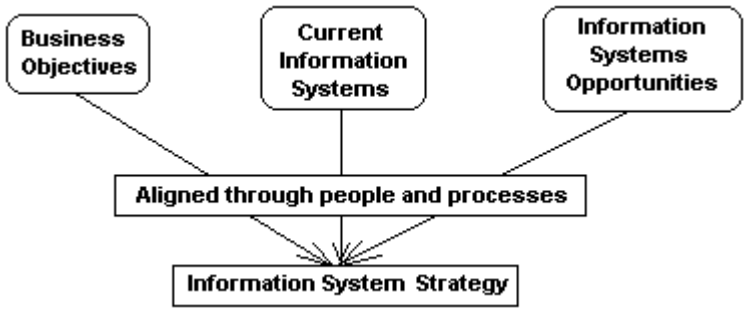

Figure 2: Strategic Alignment Model (Earl, 1989)

The models show that alignment involves the blending of strategy and systems, and that business planning and positive performance can be realised outcomes. The theoretical emphasis is placed on the functional integration of business and IS, and the fit between entity strategy and infrastructure.

Alignment Research Perspectives

Chan and Huff (1992) undertook a theoretical study and review of IS and business strategy. The study is considered a strong 'primer' for future research into the areas of IS and business alignment. The study defined several important directions and issues for alignment research. These directions include concentration of research efforts within industry sectors as opposed to cross-sector research, use of case studies and historical research methods to provide valuable analysis and understanding, a clear and unambiguous focus on strategy content and process, the use of executive inputs and views for inclusion in the research stream, and multi-level (up-down) management analysis. Importantly, the studies that have followed in the area of IS-business alignment (Reich and Benbasat 1996; 2000; Chan *et al*., 1997; Croteau *et al*., 2001) showed substantial adherence to the directions defined in the Chan and Huff study.

Alignment Measures and Influencing Factors

Reich and Benbasat (1996; 2000) conducted a study in 1993 of business units from three large Canadian life insurance companies. The study focused on measuring the linkage between business and IS objectives and factors that influence the social dimension of alignment. The study found that suitable alignment measures include cross references

between business and IS plans, IS and business manager's mutual understanding, IS and business management congruence with long term IS visions, and executive reporting of linkage. The factors that would potentially influence alignment are seen as shared domain knowledge between business and IS, IS implementation success, communication between business and IS managers, and connections between business and IS planning. Table 2 shows the mapping of corporate activities against alignment measures and factors determined in the Reich and Benbasat studies, and indicates that there is a clear association between corporate or enterprise activities and the way enterprise-IS alignment is developed and measured.

These measures and factors have a common theme of integrating IS and business systems and strategies through connective planning, communication, and knowledge sharing. The theories discussed in the studies include the duality of alignment approach (eg, intellectual and social) and the social construction of reality (eg, beliefs, attitudes and understanding are equally important with plans, systems, strategy, etc). The importance of this study is highlighted in that it provides a key understanding of how alignment is measured in empirical studies and what influencing factors might be sensibly drawn out in future research programs. The theoretical constructs are well founded and support the research of enterprise-IS alignment.

Corporate Activities	Alignment Measures	Alignment Factors
1. Planning	Cross referenced business and IS plans.	Connections between business and IS planning.
2. Communications	Reporting of the number and quality of business-IS linkages.	Shared domain knowledge between business and IS areas. Communication between business and IS managers.
3. Actions/ Implementation outcomes	IS and business having a common understanding. IS and business congruence with long term IS visions.	IS implementation success.

Table 2: Corporate Activities, Alignment measures and factors

Alignment of Strategy

Chan *et al*. (1997) conducted a large empirical study of North American financial and manufacturing companies. The study focused on measuring the business strategic orientation (proxy for business strategy), IS strategic orientation (proxy for IS strategy) and the alignment between the two orientations. What makes this study significant is that the researchers sent survey packages to Chief Executives of 900 companies in the areas of pharmaceutical and automotive parts manufacturing, banking and insurance. A survey response rate of 19% was achieved. The research model used is shown in Figure 3 (Model 1).

The study found that business strategy, IS strategy and alignment are best modelled using a 'holistic' (complete) systems approach as opposed to dimension specific 'bivariate' approaches. The research outcomes also indicated there were three generic forms of IS strategy (i.e., Analysis, Action and Anticipation), that user information satisfaction does not capture key strategic parts of IS effectiveness, and that alignment is a better predictor of IS effectiveness than IS strategy. Lastly and most importantly, business strategy, alignment and IS effectiveness have positive impacts on business performance. The study is important in that it confirms the value of enterprise-IS alignment, provides empirical evidence of strategy alignment instantiation, and supports further alignment research.

Alignment of Systemic Structures

Croteau *et al*. (2001) also conducted a large empirical study of Canadian financial and manufacturing companies. The study focused on measuring the business performance of the companies surveyed, acknowledging alignment of the organisation structures and

organisational IS. The researchers sent survey packages to Chief Executives of 945 companies in the areas of manufacturing and finance. A survey response rate of 11% was achieved. The research model used is shown in Figure 3 (Model 2).

The study uses alignment as the independent treatment variable and business performance as the key dependent outcome variable. The results of the study point to the alignment of the organisational structure and the associated organisation IS as providing positive enhancement of business performance. The study further confirms the value of enterprise-IS alignment, providing empirical evidence for the worth of alignment between the organisation and its IS.

A ROLE FOR ARCHITECTURE

The studies of alignment discussed in earlier sections of this paper and the policy determinations of modern governments leave substantial opportunities for alignment development vehicles and paradigms to be investigated. Noting that there are various enterprise architecture types and frameworks that could be used to develop enterprise-IS alignment, it is posited that the use of enterprise architectures for alignment could be investigated.

Enterprise architectures can allow business processes and information systems to be aligned and properly integrated into the fabric of the organisation. The architectural enterprise-IS fit is seen as the key dynamic in delivering improved business performance, while maintaining systems and processes in a state of equilibrium allows the organisation to realise products and outcomes (Croteau *et al*., 2001). Additionally, the architecture plays a vital role in guiding system development and support through the provision of a solid corporate platform for planning, structured analysis, design, development and construction (Zachman, 1996).

Enterprise architecture frameworks can provide for the explicit depiction of enterprise objectives, organisational units, business processes, infrastructure, data, functions and outputs and the relationships among these architectural components. The degree and manner in which the integration of these components can be represented varies with the particular enterprise architecture adopted. Thus, there is scope for the investigation of how the different frameworks contribute to integration and enterprise-IS alignment.

This paper is a first step in this process, in that it analyses a number of frameworks and methods in terms of their potential for contributing to the goals of alignment and integration. In further work, the use of Enterprise Architecture in empirical settings will be investigated. The following section provides a discussion on various architecture types, their role in structuring and developing alignment in the enterprise, and potential applications.

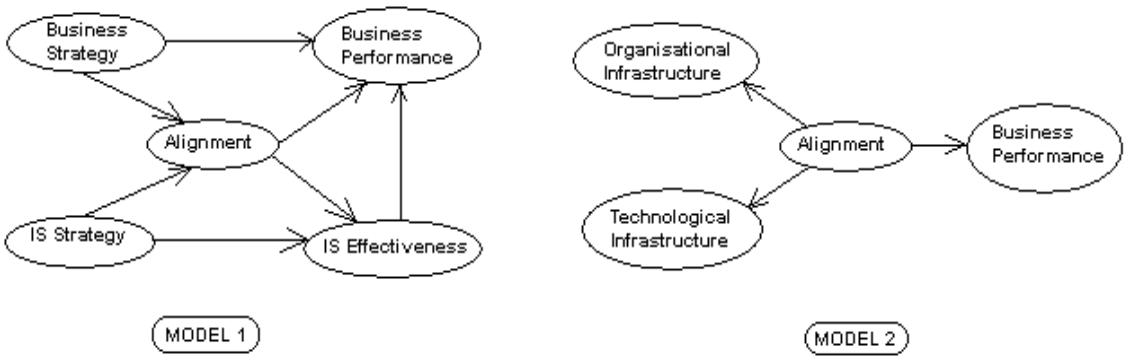

Figure 3: Alignment of Strategy Research Model (1) (Chan *et al*., 1997) and Alignment of Systemic Structures Research Model (2) (Croteau *et al*., 2001)

Zachman Enterprise Architecture Framework

The Zachman framework is built on the analogous structures that are found in the historical disciplines of public and private sector building, construction and manufacturing (Zachman,

1996). These disciplines classify and organise their realised artefacts as the complex products are produced. The framework depicts the design artefacts as the interconnecting relationship between the role-players in the enterprise and the product abstractions. The Zachman framework tends to be generic in nature and may be applied to any enterprise in the private or public sector. The Zachman framework was used as the guidance literature for the US government FEAF and is sufficiently generic for any organisation to commence a classification and architecture process using the framework.

Architecture of Integrated Information Systems (ARIS)

ARIS is complementary to Zachman and is seen as a framework of views that describe the enterprise. It allows for full integration and alignment of IS with enterprise strategy through its process-oriented view (Leonardo Consulting, 2001). The business processes, functions, data, organisational structures and outputs are the respective ARIS views. The three active levels are the main stages of a software engineering lifecycle – requirements definition, design specification and build-implementation.

ARIS has significant and direct concentration on business processing and accordingly, the process view prevails as the basis of integration of all elements in an Enterprise Architecture.

- Process view. This view shows the relationships between enterprise objectives, activities, events documents, data, organisational units, resources and knowledge sets (i.e. structure, logic, time). The technology model that is most popularly deployed is Event-driven Process Chains (e.g., SAP R/3 Enterprise System).
- Function view. Functions are used as descriptors for essential value creating activities for strategic business goals. Functions are the dynamic portion of the business process and are described in functional analysis outputs.
- Data view. Data and information are descriptors for the transformation stages of the relevant business objects. Data can form business process inputs and outputs while each transforming event can realise a data set. Entity-Relationship diagrams can be used to model the data view.
- Organisation view. Organisational entities (i.e., team, person, role, etc) are the major components of this view, where component arrangement is governed by structure, or hierarchical rules. This view shows the resource allocations required for delivery of the tasks within each business process.
- Output view. An object-oriented outlook represents the ARIS output view. This perspective captures the results of the business process and realises internal or product based results. This view also provides for product and service hierarchies.

ARIS also provides Description Levels that are matched to the software engineering lifecycle. These levels are Problem Definition, Requirement Definition, Design Specification, Implementation Description and Information Technology. The process view is the 'prime integrator' of the ARIS house. The process view integrates itself with the remaining four views to deliver the complex enterprise model. ARIS is a very powerful business process and architecture model that is supported by a suite of commercial software. ARIS has found application in various industry sectors including telecommunications (e.g., Deutsche Telekom), water authorities (e.g., Water Corporation, WA), television (e.g., TV New Zealand), oil and gas (e.g., Woodside Petroleum), and government agencies (e.g., Centrelink, Australia) for business process and architecture development.

Meta Group Enterprise Architecture (MGEA)

The META Group (Westbrock, 1999) have proposed an enterprise architecture strategy that commences with a set of common requirements and corporate vision, defines a set of guiding concepts, and establishes a set of domain architectures for enterprise growth and evolution. The Enterprise Information Architecture is platformed on an existing base of information and infrastructure. The most common enterprise architecture delivered by the strategy has two specific domains termed Business and Information Technology.

The Business domain encapsulates the Operational and Business architectures and the Information architectures. The Operational and Business architectures hold the business models, business processes and organisation (human assets) artefacts. The Information architecture defines the business language in terms of defining and publishing the meaning, source, and associated business rules for the important terms used in the enterprise. The Information architecture also has the enterprise data models and relationships resident.

The Information Technology domain encapsulates the Technical architecture and the Systems Portfolio. The Technical architecture defines the principles, technologies, products and standards that support the information environment. This includes the standard operating environments, reference models, and technical standards that underpin the environment. The Systems portfolio is the collection of all enterprise information systems and includes architectural principles, application strategies, all hardware and software components, environment gap analysis, and an evolution plan and investment strategy.

MGEA has been a popular choice for a number of public and private sector organisations (e.g., Department of Defence, Australia) that recognise a gap in their systems portfolio and are seeking to bring further disciplined management and alignment to the enterprise and associated IS. The power of the architecture lies in its evolutionary development path that measures differences between the 'as is' and 'to be' portfolio and implements changes that address the gap. The gap analysis is also fed by the domain architectures so that changes in those domains are also reflected in, and aligned with, the analysis and implementation activities of the organisation.

Computer Integrated Manufacture-Open Systems Architecture (CIM-OSA)

CIM-OSA is an enterprise operation improvement architecture configured as an integrated architecture (Kosanke and Vlietstra, 1989). The explicit description of the enterprise allows all internal and external processes and relationships to be mapped and aligned against the complete system description. CIM-OSA is a guiding construct for the design and delivery of the complete enterprise and all associated business functions (e.g., manufacture, marketing, finance, administration, etc.).

CIM-OSA has two major constructs that support enterprise integration. The Integrating Infrastructure (II) provides application integration, while the Modelling Framework (MF) supports business integration. II provides functional services to control and execute activities, information services to support information processing, communication services to support internal and external communications, and human-IS interface services.

There are three specific modelling levels that form part of the CIM-OSA framework – Requirements Definition for the enterprise, Design Specification of business processes and activities, and Implementation Description that selects entities for further processing and execution. The views that are facilitated by CIM-OSA are as follows:

- Function view is a depiction of the enterprise in terms of the structured business processes. Each process is constrained by its procedural rule set that is in turn defined by event triggers and results.
- Information view is the aggregate of all enterprise information. The information is decomposed into classes and enterprise information objects, with object views and editions encapsulated in domains.
- Resource view contains all relevant information about the enterprise resources, and is formed through the hierarchical assembly of matching resources to enterprise requirements.
- Organisational view contains the various responsibility assignments for the enterprise and allows for view structuring in line with function, information and resource allocation.

CIM-OSA makes the important point that people make enterprise systems work. People drive IT and manufacturing systems and not the other way round. CIM-OSA provides for Business, Application and Physical integration in the engineering and operations environments of manufacturing entities. CIM-OSA was developed as a specific integration vehicle and has found application in a range of information technology and

telecommunications (e.g., Alcatel, Bull), electrical (e.g., AEG, Philips, Siemens), aerospace (e.g., Aerospatiale, British Aerospace) and automotive (e.g., Fiat, Volkswagen) manufacturing companies in the European Union.

Comparison of enterprise architecture frameworks and methods

Table 3 shows a comparison of enterprise architecture frameworks and methods in terms of their description, creation and potential contribution to strategy-IS alignment. The summary shows that architectures can be formed through the composition of various views (e.g., data, resource) and components (e.g., processes, design, networks). These architecture types can take various forms including geometric shapes (e.g., CIM-OSA cuboid), physical artefact descriptions (e.g., ARIS house), or standardised box link diagrams (e.g., MGEA). The value of these various architectural tools lays in their capacity to 'integrate and align' organisational elements.

Table 3 provides potential users with some indication as to where best to place effort and resources (e.g., integration services, tactical planning, business processes). In particular, an opportunity is presented to further investigate the architectures provided in this paper, or to seek other architecture frameworks or methods (e.g., The Open Group Architectural Framework (TOGAF) (TOGAF Version 7, 2001) that best suit user needs. In any case, a number of generic and specific architectural frameworks and methods are provided in this paper for consideration, review and further research.

The true value of architecture may lie in its capability to play a positive role in developing enterprise-IS alignment for a number of different business types and enterprises. Importantly, the various architecture methods display an underlying characteristic for binding business strategies, structures and systems (e.g., MGEA). It might be sensibly observed that the architectural frameworks drive alignment through the integrated support of planning, resourcing, and systems development at the enterprise level (e.g., Zachman Framework).

Framework/ Method	Description/ Architecture Creation	Alignment Application/ Key Aspects
Zachman Architecture Framework	A generic classification framework. Conceptual, logical and physical views mapped to data, function and network layers.	Initial architectural framework. Highly focused on developing enterprise artefacts. Emphasis on Integration and Alignment of framework elements. Concentration on strategic and tactical planning construct development.
ARIS	ARIS house concept. Process View integrates the Organisational, Data and Functional views. Output view shows the instantiated products and services.	Generic business architecture. High focus on business process modelling and architecture. Aligns and integrates data, functions and organisational views. Wide application for various enterprise types. Supported by modelling software toolset.
MGEA	Business and IT domains or structures are integrated. Gap analysis drives architectural evolution in both domains.	Generic business architecture, but widely used in IT community. High focus on integrating business processes, operations and IS/ IT in various organisations. Strong emphasis on applications development and IT infrastructure alignment.
CIM-OSA	CIM-OSA cuboid concept. Integration Infrastructure and Services integrate the Function, Information, Resource and Organisation views.	Architecture for manufacturing entity. Integration Infrastructure and Services facilitate the architecture. Emphasis on manufacturing systems integration of entity functions, information and resources.

Table 3: Enterprise Architecture Frameworks and Methods

IMPLICATIONS FOR FUTURE ALIGNMENT STUDIES AND POLICY DECISIONS

Future alignment research has a substantial range of possibilities in terms of describing and defining treatments that facilitate enterprise-IS alignment. These treatments may take various useable forms including Business Process Re-engineering, improved Systems Requirements Engineering, or (as has been discussed in this paper) the use of Enterprise Architecture principles. There are a number of useful general and specific architectures that can be applied to various enterprises and businesses. MGEA and ARIS provide suitable generalist architectures for any business entity, while CIM-OSA might be used in a manufacturing, or other suitable (generic) enterprise environment.

Due to the lack of empirical studies in the area of Enterprise Architecture, a doctoral research program is in progress that examines the use of enterprise architecture in government entities. The research is using a case study based approach (including a small control group) to broadly examine and explore the architectural practices in government and determine how these practices contribute to the alignment of enterprise strategy and IS. In contrast, past research has focused to some extent on the use of Chief Executive opinions and surveys while proposing alignment as the treatment (independent) variable and outcomes, such as business performance, as the dependent variable.

The research model considers the enterprise inputs of corporate governance, resources, IS and strategy being incorporated into the use of enterprise architecture and tests whether strategy-IS alignment is exhibited. Alignment indicators include traceability (i.e., executive directive through to IS deployment), fit (i.e., business strategy and IS fit) and equilibrium (i.e., balance of systems, processes and procedures facilitating business outputs). Additionally, the study is examining whether Strategic IS Planning artefacts result from the use of enterprise architecture. Case study interviews and materials gathering are currently being conducted.

The implications for local policy makers are probably best seen in the actions of the US government. There may be a strong argument to mandate the adoption of an Enterprise Architecture approach, or a suitable enterprise framework. The ability to inter-operate with other agencies, and the growing requirement to exchange information resources across the web and other interfaces provides the impetus to move to a greater level of integration and architectural discipline in government. The time has arrived to actively consider the policy and options for working in a truly integrated e-Government environment. While not providing the complete solution, enterprise architectures may play some positive role in governmental integration and interoperability.

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