Communications of the Association for Information Systems

Volume 29 Article 23

11-2011

Business Architectures in the Public Sector: Experiences from Practice

Harry Bouwman
Faculty of Technology, Policy and Management, Delft University of Technology, w.a.g.a.bouwman@tudelft.nl

Harrie van Houtum
Faculty of Technology, Policy and Management, Delft University of Technology

Marijn Janssen
Faculty of Technology, Policy and Management, Delft University of Technology

Gerrit Versteeg
Faculty of Technology, Policy and Management, Delft University of Technology

Communications of the Association for Information Systems

CAIS

Business Architectures in the Public Sector: Experiences from Practice

Harry Bouwman

Faculty of Technology, Policy and Management, Delft University of Technology

w.a.g.a.bouwman@tudelft.nl

Harrie van Houtum

Faculty of Technology, Policy and Management, Delft University of Technology

Marijn Janssen

Faculty of Technology, Policy and Management, Delft University of Technology

Gerrit Versteeg

Faculty of Technology, Policy and Management, Delft University of Technology

Abstract:

Government agencies need to transform the way in which they are organized in order to be able to provide better services to their constituents and adapt to changes in legislation. Whereas much e-government research has a technology focus, our goal is to investigate whether business architectures can help governments to recreate agencies to make them robust in dealing with political preferences, and further, whether their adoption can guide the realization of IT-oriented enterprise architectures. In this article the concept of business architecture and its implications are analyzed by investigating the case study of the Dutch Immigration and Naturalization Services. The case demonstrates the mediating role business architectures can play between policy and strategy on the one hand, and enterprise IT architecture on the other. Business architectures help: (1) to define business domains and the events connecting them, and (2) to use principles to integrate the domains and ensure synergies. Business domains can be designed and operated independently, which enable higher levels of adaptability. Our case analyses show that the pluriformity of the political visions, public values, and actors involved and the division of responsibilities complicate the creation of a business architecture.

Key words: e-government, enterprise IT architecture, business architecture, orchestration, transformation, agility

Volume 29, Article 23, pp. 411-426, November 2011

The manuscript was received 3/7/2010 and was with the authors 9 months for 2 revisions.

I. INTRODUCTION

The field of e-government first appeared in the late 1990s [Grönlund and Horan, 2005]. Both researchers and practitioners have suggested that if e-government is to achieve a successful transformation of the public sector (i.e., reduce cost, eliminate waste, and improve efficiency, transparency, and quality of service), public agencies will need to change the way they are organized [Andersen and Henriksen, 2006; Weerakkody and Dhillon, 2008]. Many governments want to improve the services they provide to citizens and businesses and strive to display a higher level of responsiveness in a dynamic and continuously changing environment [Chen, 2002]. Governments around the world are hampered in their ability to respond to the changing needs, demands, and preferences of their customers by the existence of organizational stovepipe systems and legacy systems. To service customers and citizens more effectively and efficiently, government agencies, processes, information, and applications have to be coherent and able to adapt to changing circumstances. Government agencies have to be flexible, while at the same time ensuring that organizational structures, processes, and information architectures are aligned.

A critical assessment of the internal processes in many government agencies reveals a substantial level of redundancy and rigidity, as well as a lack of modularity. Moreover, processes are usually organized in (often product-oriented) stovepipe systems [Van Diepen, 2000]. As a result, governments are unable to meet customer needs, coordinate their processes in a coherent manner or offer the transparency modern customers demand. There is a need to redesign and modularize government processes (e.g., Dhillon, Weerakkody, and Dwivedi, 2008; Hammer and Champy, 1993). Due to the failing connection between the new customer-oriented business processes, which require specific information to be available at the right moment, and the existing rigid product-oriented processes and information architectures, government agencies find it next to impossible to implement services for citizens.

The combination of path dependencies, existing (legacy) Information Systems, and a lack of clear interfaces between the inter- and intra-agency Information Systems on which many government services rely often makes it hard to realize changes in service delivery processes. Governments are limited in their ability to respond to the changing requirements of their citizens due to a lack of flexibility and adaptability of their organizational structures, processes, and information architectures. The organization structure, processes, and applications involved need to be revised and their complexity reduced, which requires a modular approach based on well-defined and standardized interfaces between organizational units and Information Systems. However, this will affect the way these modules (for instance, responsibility areas and related Web services) are defined, combined, and/or reused, as well as their scalability and the extent to which they can be used in a distributed organizational environment [Turban, McLean, and Wetherbe, 2004]. Enterprise IT architecture can be supportive in the creation and sustainment of IT efficiency and IT flexibility [Schmidt and Buxmann, 2011]. Business architecture can be an important tool in dealing with the issues involved in ensuring a coherent set of modules that fit organizational responsibility domains, as well as the processes, applications, and information architectures which are relevant for them and for which they are responsible [Versteeg and Bouwman, 2005]. Business architecture is related to business operation and strategy, and less to technical architecture. We follow Schmidt and Buxmann [2011] and denote the latter as *enterprise IT architecture,* although recently enterprise architectures have also been taking business strategy into account [Op 't Land et al., 2009]. A business architecture helps to implement a business strategy and is the starting point for the development of the IT-oriented enterprise architecture which can be formulated in terms of process, information, and application architectures. In our view, business architectures merit greater attention than they are currently receiving in the public sector, as they can help translate an organization's policies and strategies into an information and process—as well as a technological—design. We disagree with views in which a business architecture is viewed as merely one of the elements making up an enterprise IT architecture [Perks and Beveridge, 2002]. A business architecture helps to establish a connection between the business side and the IT-related enterprise architecture [Versteeg and Bouwman, 2005]. The aim of this study is to clarify and understand the business architecture concept in the public sector by investigating two questions: *(1) Can the concept of business architecture be used within the e-government domain in order to structure government agencies?* and *(2) What are the implications of the use of a business architecture for government agencies?*

To answer these questions, we begin by elaborating on insights provided by literature. We then use our concepts to analyze the model in a case study involving the Dutch Immigration and Naturalization Services (INS), focusing on the usability and implications of the model for e-government cases. We investigated documents and conducted eight

semi-structured interviews between January and June of 2009 to advance our understanding of the agency's business architecture.

II. BACKGROUND: WHAT IS A BUSINESS ARCHITECTURE?

Buckle et al. [2010] found that sound definitions of concepts related to architecture are lacking. Various authors use business and enterprise IT architecture interchangeably [Op 't Land et al., 2009; Perks and Beveridge, 2002]. Nevertheless, for conceptual clearness and unambiguous use, clear concepts are of importance. Hence, the aim of our literature review is to form a distinct characterization of enterprise IT architecture and business architecture.

III. ENTERPRISE IT ARCHITECTURE

Initially, the architecture concept in Information Systems was used in modeling approaches [Architecture Working Group, 2000; van Rensburg, 1997], in classification frameworks [Mathora, 1996; Valtonen and Leppänen, 2009; Zachman, 1987] and by software suppliers and consultancy firms [Arbab et al., 2002]. Many authors discussing the architecture concept in the early 2000s tended to go straight to the technical specifications of information, application or technology architectures, rather than using some form of underlying business logic to guide their approach. These types of architecture are based on Zachman's approach and are often labeled as enterprise IT architecture. The term 'enterprise' refers to the holistic nature of the enterprise in its entirety. Enterprise IT architectures describe an enterprise from various levels of abstraction and capture mainly information systems and technology views. Differences between types of enterprise IT architectures can be found in the level of specification as well as in the layers (business, information, technology) and approaches (logical, physical) that can be distinguished. Several case studies focus specifically on the field of enterprise IT architecture [Besson, Green, and Sa, 2002; Chandra and Kumar, 2001; Richardson, Jackson, and Dickson, 1990; Veasey, 2001; Wolfenden and Welch, 2000].

The main aim of enterprise IT architecture was and is to master the development and evolution of Information Systems (IS) [Simonin et al., 2010]. Architectures "*define and interrelate data, hardware, software and communication resources, as well as the supporting organization that is needed to maintain the overall physical structure required by the architecture*" [Richardson et al., 1990, p. 386]. An enterprise IT architecture framework formula specifies how information technology is related to the overall business processes and outcomes, describing the relationships between the technical, organizational and institutional components of an enterprise [Zachman, 1987]. Often it includes a blueprint of the existing as well as the envisaged design, and an overall strategy designed to move toward that envisaged design [Architecture Working Group, 2000; Zachman, 1987]. Enterprise IT architecture models provide ways of dealing with an agency's complex environment, which includes work (who, where), function (how), information (what), and infrastructure (how to) [Ross, 2003]. Enterprise IT architectures are often viewed in the same light as any architecture having an enterprise-wide scope [McGovern et al., 2006; Ross, 2003], as the word "enterprise" indicates that the architecture in question includes the entire agency, ranging from the organizational to the technological level.

There is a plethora of definitions of enterprise IT architecture (e.g., Architecture Working Group, 2000; Bernard, 2004; Doucet et al., 2008; Janssen and Verbraeck, 2005; Ross, 2003; Schekkerman, 2003) and no uniform view [Ross, 2003]. A commonly used definition is that of the architecture working group as described in the IEEE Std 1471–2000: "*Architecture is the fundamental organization of a system embodied in its components, their relationships to each other, and to the environment, and the principle guiding its design and evolution"* [2000, p. 3]. Generically, architecture is the description and prescription of a set of elements and the relationships between them. The common element in these definitions is that enterprise IT architecture refers to a blueprint described at a certain level of abstraction. The blueprint describes the coordination and coherence among the elements facilitating development. Ross [2003] provides another view on enterprise IT architecture and defines architecture as "*the organizing logic for applications, data, and infrastructure technologies, as captured in a set of policies and technical choices, intended to enable the firm's business strategy*" (p. 32). All of those definitions focus on IT issues; however, the view on the main goals of enterprise IT architecture is less uniform.

IV. BUSINESS ARCHITECTURE

Although the term *business architecture* has been used in numerous publications, no unambiguous definition has been provided to date [Nayak et al., 2007; Perks and Beveridge, 2002; Versteeg and Bouwman, 2005]. Some scholars view a business architecture as merely one of the elements that make up an enterprise IT architecture [Perks and Beveridge, 2002]. A business architecture is an architecture that is designed specifically to structure responsibilities regarding economic activities—which in our case of government agencies means service-related activities—by multiple public or private organizations (public network level), individual organizations (enterprise level), or parts of an organization (departmental level). Nayak et al. [2007, p. 723] see a business architecture as the art and science of delivering coherent, dynamic, and complete business design. This implies that business architectures should and could be focused on business assets, among others, instead of on Information Technology.

A business architecture is specifically designed to structure responsibilities regarding economic activities in business domains [Nayak et al., 2007; Perks and Beveridge, 2002; Versteeg and Bouwman, 2005]. Business architectures can go beyond the IT/IS aspect to also include HRM, operational processes, marketing activities, or management of other assets. These business domains are defined by the responsibility for economic activities and the assets and resources necessary for the execution of the economic activities. In principle, value exchange between business domains occurs, and supply and demand functions between organizational units can be defined based on the business architecture. These demand and supply relationships can be within or between businesses and/or (public) organizations. In this approach the business strategy is the *starting point* for the business architecture and defines the way in which responsibilities regarding economic activities are structured. A business architecture is a top-down approach to implementing a business strategy. Table 1 characterizes the main differences between business architecture and enterprise IT architecture. As mentioned, reality can be more subtle, as there are various views on these two types of architecture. Although enterprise IT architecture can include the main aspects of a business architecture, this results in conceptual ambiguity, which is why we opt in favor of drawing a clear distinction between business and enterprise architecture.

Table 1: Characterizing Differences Between Business and Enterprise IT Architecture

	Business architecture	Enterprise IT architecture
Scope	Top-down structuring of responsibilities at strategic level (responsibilities go beyond the IT function)	Enterprise-wide use of technology at all levels within the organization (e.g., application, data, process, information, infrastructure)
Depth	High-level principles driven by strategy statements independent of technology	Principles defined by IT and communicated and aligned with business at various levels
Focus	Strategy implementation	Focus on IS/ IT support, design, development, and maintenance of products, services, processes, and applications of an enterprise
Approach	Top-down structure of responsibilities regarding economic activities (business domains), based on hierarchically ordered business principles derived from core (and refined) strategy statements	Identification of elements and objects and their relationships, modeling of stakeholder requirements, and identification of relevant concerns (not necessarily strategic in nature) Design approach focusing on frameworks, (meta-)models, languages, principles, views, concerns, and tools

The connection between business strategy and IT is also made in strategic alignment approaches [Henderson and Venkatraman, 1993]. In this domain, more (large-scale) studies have been conducted [Cragg, King, and Hussin, 2002], and there has been a shift from case studies toward more overarching surveys [Teo and Ang, 1999]. In addition, in this domain a connection has been made with business model literature. According to Hedman and Kalling [2003], the concepts of business model and strategy are increasingly interchangeable, and instead of formulating a strategy, companies design a business model. In our view, policy and organizational strategy, in combination with generic or specifically used business models, can provide important input for business architectures. Wolfenden and Welch [2000] view business architecture as mediating between strategy and business processes, roles, behavior, and information. Other authors take a more holistic approach to realizing changes in strategy and redesigning an organization [Veasey, 2001]. The concept of business architecture is used to structure the organizational responsibilities and to elaborate on them in order to structure individual aspects at the process-related, data-related, functional, and technological levels. The business architecture divides responsibilities into domains that can be viewed as *areas of accountability* [Versteeg and Bouwman, 2005, p. 92]. Bouwman and Versteeg [2005, p. 93] look at business units: "*the grouping of business functions and related business objects into clusters (business units) over which meaningful accountability can be taken as depicted in the high level description of the related processes.*" Subsequently, the business units are allocated to specific stakeholders.

Recently, business aspects have occupied a more prominent position in enterprise IT architecture, even though the positioning of strategy and business architecture is not always clear. Buckle et al. [2010] argue that sound definitions for business and management concepts are lacking and that concepts such as strategy, principles, and objectives are used interchangeably. In some approaches it is recognized that strategy is most important [Op 't Land et al., 2009]. However, according to The Open Group Architecture Framework (TOGAF) approach to enterprise IT architecture, business architecture (or business process architecture) defines strategy [TOGAF, 2009, p. 10] and is, therefore, seen by some as a part of enterprise IT architecture [Morris et al., 2009]. Others see business and enterprise IT architecture as interchangeable [Hoogervorst, 2004], while still others simplify and misinterpret the business architecture concept as being the demand side and IT architecture as the supply side [Bruls et al., 2010), although views differ on the leading character of business over enterprise IT architecture and vice versa. In our view it is more important that business architectures be made explicit than whether they should be part of enterprise IT architectures.

V. POSITIONING OF BUSINESS ARCHITECTURES

It follows from the previous section that a business architecture is based directly on an organization's public mission, policy, and strategy (see Figure 1), which, in the case of a government agency, is defined by politicians and societal influence. This view is based on the textbook model of society, consisting of politics, administration, and civil society [Grönlund and Horan, 2005]. Often, the reason for public agencies' existence is defined by law. A business architecture provides the foundation for subsequent architectures (strategy embedding), where it is divided into its various aspects and disciplines. The strategy of public agencies is based on elements such as political ambitions, policy and strategy statements, organizational goals and objectives, etc. Statements formulated by politicians and high-level public servants can be strategic, tactical, and sometimes even operational in nature. Often, strategic statements also include an agency's primary goal, why it was founded, and what the expected benefits are to citizens/businesses and society as a whole.

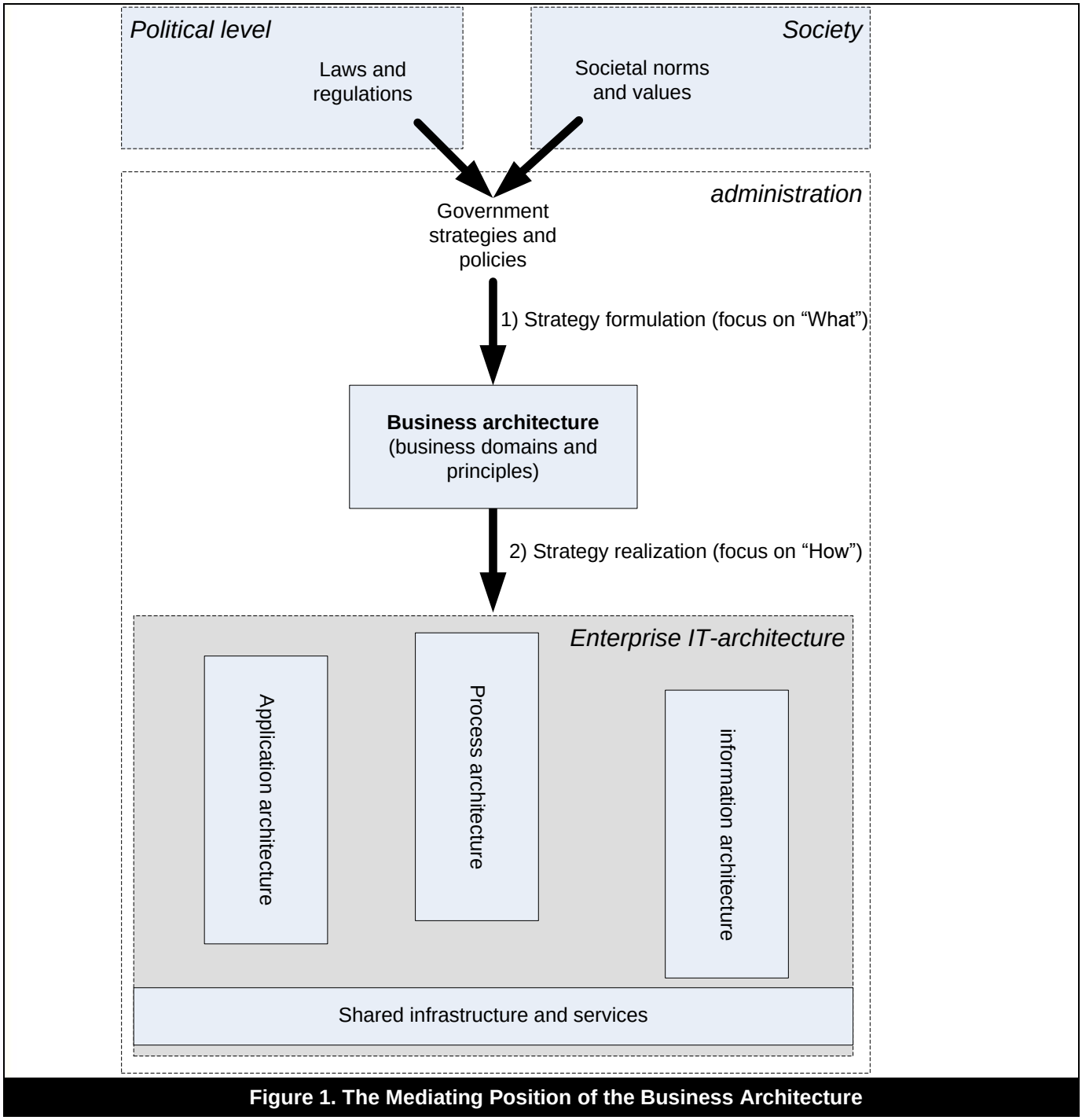

Figure 1. The Mediating Position of the Business Architecture

In a business architecture, the organizational policy and strategy and the relevant laws and regulations are used as a starting point. These sources often determine the public tasks of government organizations. The core problem for

Communications of the Association for Information Systems

government agencies in relation to this is that the circumstances under which they operate can change rapidly due to political preferences, which means that a careful analysis and description of relevant statements is essential in order to determine at what level and in what way alternative statements or the expression of alternative political views may affect the business architecture. As such, these statements are preferably expressed as politically neutral and sustainable business principles.

Business architectures are preferably created by policy-oriented and strategy-oriented staff who have a basic understanding of government processes, the role of information, and the capabilities of technology. In addition, a business architecture should be owned and maintained by line managers rather than IT departments. Within larger organizations, it is often claimed that the IT department is not backed up by the line organization. This is caused by, among other things, the technological nature of architectural thinking and the association with information and communication technology. The creation of a business architecture by public administrators gives the organization a (nontechnological and, therefore, understandable) tool to influence the subsequent IT architecture, while the IT department is presented with clearly formulated and structured requirements. The existence of a business architecture can benefit both public administrators and IT departments. A business architecture should provide insight into the consequences of individual or business principles and the way they are related to one another. The latter is important, as otherwise the ambition to realize low-cost, highly agile, and political-preference-dependent customer service may not be realistic. Supported by interaction with relevant managers, a clear distinction between political and nonpolitical statements, and by the hierarchical definition of strategy statements, a business architecture gains more and more detail (more levels are added and politically sensitive and politically neutral "responsibility" domains are identified and specified). Throughout the course of this process, the mission and policy of the public organization and the role and consequences of changing policies will become increasingly clear. This results in a better understanding of the mission, visions, and policies themselves, the consequences of the various political and nonpolitical statements, and the implementation of policies. The business architecture determines whether or not strategies and policies are realistic and feasible and whether they fit within the current way of providing services. For example, a business architecture should prevent an organization from being made responsible for new tasks without being able to handle them, as was the case with the Dutch Internal Revenue Service in 2006, which resulted in a loss of data.

The business architecture provides direction to the structuring of enterprise IT architecture, in addition to being the starting point for the prestructuring of the subsequent subarchitectures. All the subarchitectures together make up the enterprise IT architecture. Furthermore, business architecture can be viewed as one of the elements of the broader enterprise IT architecture. The business architecture defines the relationships between the various subarchitectures (application, process, and information). The business domains have their own added value, which is why they also cluster requirements in a coherent way, and because the functional decomposition is based on the business architecture, the IT supply domains are, in a sense, already related to the logical clusters of organizational requirements reflected in the organizational domains. In the basic architecture model, there is a clear connection among the information, process, and applications architectures. Groups of IT functions and data (information architecture) are used by the business process (process architecture) in the form of an "application" or Web-frontend (application architecture). The architecture model shows the connections between business architecture on the one hand, and the information, process, and application architecture on the other.

The position of a business architecture gives it a structuring role with regard to the way a public or private agency is organized by clearly indicating what the perspectives and organizational domains are, while at the same time defining responsibilities and supply-and-demand relationships. In addition, the basic model shown in Figure 1 clarifies the function of vision and policy statements (Strategy formulation) and the models that are used to realize the business architecture (Strategy realization). Business architecture models shed light on the scantly elaborated relationships between vision and policies on the one hand, and the organizational design on the other. We illustrate the value of business architectures in a case study.

VI. CASE STUDY: THE DUTCH IMMIGRATION AND NATURALIZATION SERVICE

Applying the concept of business architecture to public organizations may provide several benefits. We analyzed the Dutch Immigration and Naturalization Service (*Immigratie- en Naturalisatiedienst*, which will be abbreviated as INS in accordance with the English translation), the government agency that serves as the main point of entry into the Netherlands for immigrants. It is responsible for providing all services with regard to immigration and naturalization to Dutch citizens, asylum seekers, and people who want to work in the Netherlands. It has over 3,500 employees in nine office buildings throughout the country, with its headquarters in Rijswijk. It is responsible for implementing a complex set of regulations from a variety of sources, including international law, national law, case decisions, and policy directives. To carry out its constitutional duties, the INS works with other government organizations, including the national police force, the country's municipalities, and embassies in many different countries.

In the past, the INS has been criticized by the national accountability office (*Algemene Rekenkamer*[1]) for taking too long to arrive at decisions and for lacking efficiency and customer focus. Initially, this resulted in a focus on reducing the decision-making time frame, followed by a major reorganization based on a new architecture. One of the main causes of efficiency and customer-orientation problems was that the organization's business processes depend to a large extent on laws and regulations designed by politicians. Because modified and new legislation need to be incorporated into the organization's architecture, there has to be a mechanism to include new legislation in an agile and efficient manner. In the following sections, the business domains and business principles influencing the INS's enterprise IT architecture are discussed, followed by a brief description of the resulting enterprise IT architecture and an explanation of the way in which its business architecture affects its enterprise IT architecture. Using document analysis and interviews within the policy-making and organizational department of the INS, a retrospective view was created on the design and use of business architectures. Although different terms were used within the INS, we will use our terminology introduced in the previous section to describe the case study.

Business Domains

The business architecture of the INS has been driven mainly by a need to improve the agency's ability to deal efficiently and effectively with the continuous influx of new and revised legislation. It should be able to adapt to legislation originating from a variety of Ministries within a short time frame without increasing its costs. Furthermore, business processes should be customer-oriented and in compliance with legal requests. Although the business domain should contain loosely coupled and accountable units, this should not limit the agency's ability to realize synergy by sharing applications and services. To this end, our document analysis shows that the INS has organized itself in five main business domains: (1) Migration, (2) Asylum, (3) Naturalization, (4) Repatriation, and (5) Legal Affairs. The basic design closely resembles the process chain. The two basic principles underlying the identification of the business domains are that their activities are driven by different kinds of legislation and can be separated from the other domains.

1. *Business domain: Migration* The migration domain deals with all foreign nationals who come to the Netherlands to work, study, or stay with relatives, which together are also referred to as regular residence. Anybody who stays in the Netherlands for longer than three months needs to apply for a residence permit, while for shorter periods a visa suffices.
2. *Business domain: Asylum* Every foreign national has the right to request asylum. It is the INS that investigates whether a person is eligible for asylum. If so, he or she will be granted an asylum residence permit. In the year 2006, 14,470 asylum seekers applied for such a permit in the Netherlands (www.ind.nl).
3. *Business domain: Naturalization* Naturalization is the process of granting a foreign national Dutch citizenship. Foreign nationals can submit a request to the municipality in which they live. If they meet the relevant conditions, Dutch citizenship can be granted and an application for a Dutch passport can be submitted to the municipality in question.
4. *Business domain: Repatriation* Repatriation is the process of returning foreign nationals to their country of origin after they have exhausted all legal avenues. This often involves intensive interaction with the police. As a rule, this business domain is subject to fewer legislative changes than the previous business domains.
5. *Business domain: Legal Court case representation* The INS makes decisions on behalf of the Ministers of Justice and Foreign Affairs. If foreign nationals do not agree with a decision, they can appeal and bring the case to court. The presiding judge can ask the INS to motivate its decision. This process is handled by legal representatives of the INS.

In this model, the traditional division into functional departments is replaced by a focus on accountable business domains responsible for specific activities. Individual pieces of legislation typically influence only one business domain. For example, legislation affecting the naturalization domain usually does not affect the other domains. In this way the business architecture creates the necessary conditions to deal with changes in legislation and be agile.

Business Principles

The business architecture contains both the business domains and principles. The business domains are independent of each other and need to be complemented by principles that ensure synergy between the domains by guiding the implementation of the process, information, and application architecture. These principles have to ensure that the various business domains design their architecture in an orchestrated manner rather than acting as independent organizations, while at the same time maintaining enough independence to guarantee the flexibility required to carry out their duties. The principles are derived based on both document analyses and interviews.

[1] Kamerstukken II 2004/05, 30 240, nrs.1–2

Because the principles were found scattered in various documents, we needed to conduct interviews to be able to formulate them explicitly. The main reason was that management was very reluctant to give the principles a formal status. The interviews revealed that the formulation of the business principles was complicated by the involvement of many stakeholders, all of whom had other ideas about business principles. Several interviewees indicated that a huge risk is that the business principles could become a compromise and result in too many and too detailed principles. This would result in a lack of clarity and a need to change them regularly. To tackle this, a process was started which had the goal of deriving a limited number of principles. In this process, higher management and administrative staff were involved to ensure support and commitment. The principles should be not conflict and should not require the making of trade-offs.

Business principle 1: Separate knowledge from the workflow and systems

Because the INS has to deal with a continuous flow of legislative changes, which are often affected by international affairs, its knowledge and decision-making rules should not be hardwired in its applications, but should remain easy to change [Gong and Janssen, 2011].

Business principle 2: Sharing of resources

Wherever possible, resources like services, repositories, and software components should be shared in order to avoid duplication, create unity with regard to information sources, and consequently prevent redundant investments. Applying this principle can prevent IT "silos" from being set up in different departments, which means the system will be easier to maintain. This implies that standard software implementations are used and that the software components are unbundled and can be used for a variety of purposes.

Business principle 3: One data collection per basic object

A *de jure* principle is that all governmental organizations use the Dutch National Registries, which contain basic information that is managed on the basis of information stewardship and used by several public organizations. *De jure* principles result directly from existing legislation and rules or decisions issued by legislative authorities, and should, therefore, be followed to ensure that information is requested only once and then reused. Apart from the external motivation, this implies that each business domain must ensure that its information is stored and made available to the other business domains and, whenever relevant, to external parties.

Business principle 4: Use of shared and interoperable infrastructure

The enterprise service bus (ESB) and its related services (security, translations, etc.) must be used for all communication within the INS and between the INS and its chain partners, as well as all business logic regarding the application of a highly skilled immigrant residence permit. All applications and software components must use the ESB so as to guarantee future extensibility and flexibility. This implies the use of open standards to reduce dependency on specific developers. Underlying this principle is the assumption that standards should be agreed upon with other organizations in the Netherlands.

Business principle 5: Event-driven orchestration as integrative mechanism

The business domains and the activities they contain have to be integrated in a flexible manner without compromising their relative independence. Furthermore, new business domains or tasks may be added or the relationships between the domains can be redefined in response to changing political circumstances. The business architecture provides the foundation for event-based orchestration. The coordination of the processes of various organizations or departments can be labeled *orchestration* [Janssen, Gortmaker, and Wagenaar, 2006]. Event-based orchestration is used as a mechanism to manage the interactions between individual organizations (e.g. Overbeek, Klievink, and Janssen, 2009; Sheng, Benatallah, and Maamar, 2008). In such a mechanism, events are the basic "building blocks" and can be defined as state changes resulting in notable occurrences at a particular time. Events can be generated externally, by customers or businesses interacting with the organization, or internally, and they can initiate relevant processes. In this way, they are used to inform or instruct other business domains and to notify relevant parties of a change in information, although they do not contain the information itself, to ensure that the business domains are loosely coupled. The purpose of events is to create a high-level orchestration without being involved in the actual business domains, by adding high-level information flows and simple interactions in addition to the regular process execution. Interactions between citizens and businesses (external) and business domains (internal) are handled by events, with the events being generated by citizens, businesses, and the business domains, respectively.

Business principle 6: Transparency of decisions and service delivery

Transparency is a multidimensional concept that can be translated into various elements that affect the organization. Its main goal is to make expectations, decisions, and responsibilities clear to applicants. First, the INS must guarantee a one-stop-shop service delivery and act as a single seamless entity with no wrong doors. Applicants should know to which services they are entitled and under what conditions their requests will be granted. Information should be made publicly available and accessible, allowing applicants to see whether or not they are being treated fairly and equally. Another benefit is that this approach may discourage applicants who can see in advance that their request will be rejected. One of the main reasons to include this principle is the lack of consistency and uniformity among the various service delivery channels. In the past, policies were implemented through each service delivery channel (embassies, Internet, call center, office) and regularly resulted in different outcomes, which is considered unacceptable.

The one-stop-shop principle also implies that all decisions are clear and accessible, and that the various business units have clear governance and stewardship and are accountable for their (in)actions.

From Business Architecture to Enterprise IT Architecture

Next, the business architecture, its five business domains, and its six business principles were translated into an IT-oriented enterprise architecture which was described in terms of process, application, and information architecture as schematically shown in Figure 2. The business architecture starts at the top (directly below policies and strategy), while the enterprise IT architecture is shown at the bottom of the figure. For each business domain, there is a separate process, application, and information architecture which can be shown by pressing one of the five tabs. The shared information sources and infrastructure are commonly used among the business domains. The business architecture was purposefully separated from the process, application, and information architecture and the shared information sources infrastructure, which together make up as the organization's enterprise IT architecture. The interviews revealed that this was done using an interactive process in which both the business architectures and the managers and staff from the five domains have intensive interactions and discussions with each other. The process, information, and applications architectures use the above-mentioned business domains and principles as their starting point.

Process Architecture

The process architecture is detailed for each of the business domains. We refrain from including all details, as this would go beyond the scope of this article. To profit from the synergies among the business domains, similar high-level process architectures have been identified, making it possible to reuse process building blocks in the business domain. Generally speaking, the process is divided into the following phases:

1. Submission and registration: receiving and logging the applications.
2. Information gathering: gathering the information needed to make a decision. This means building a profile of the client and collecting data concerning the situation and other factors that may be relevant, for instance, the applicant's health. The kind of information that needs to be collected is determined by legislation.
3. Filtering: checking whether the applicant's information matches the relevant legal criteria, based on a comparison with risk profiles created from past experiences, the extrapolation of trends, etc.
4. Decision-making: this can be (partly) automated or carried out by people. Often, people are involved to interpret the situation within a country of origin or an applicant's health. Every year, a sample is taken to check whether the decisions that have been made comply with existing legislation.
5. Notification and issuing: the applicant and other relevant parties (embassy, municipalities, police) are informed, and appropriate measure are taken.

At an abstract level, these five stages reflect all the process-related activities within the INS, which means that (parts of) the business processes can be reused. At most stages within the business processes, internal and external services are used. Some of the external services are provided electronically. The manner in which they are involved and which services should be invoked may also depend on legislative and regulatory changes. The services are connected via the ESB, which will be discussed in the application architecture section below.

Events constitute the main communication and interaction vehicle within the processes, as guided by the fifth business principle. For example, an application for a residence permit will result in an event (Residence Permit Request), which triggers the processing of this request and results in a response, which in turn can be viewed as an

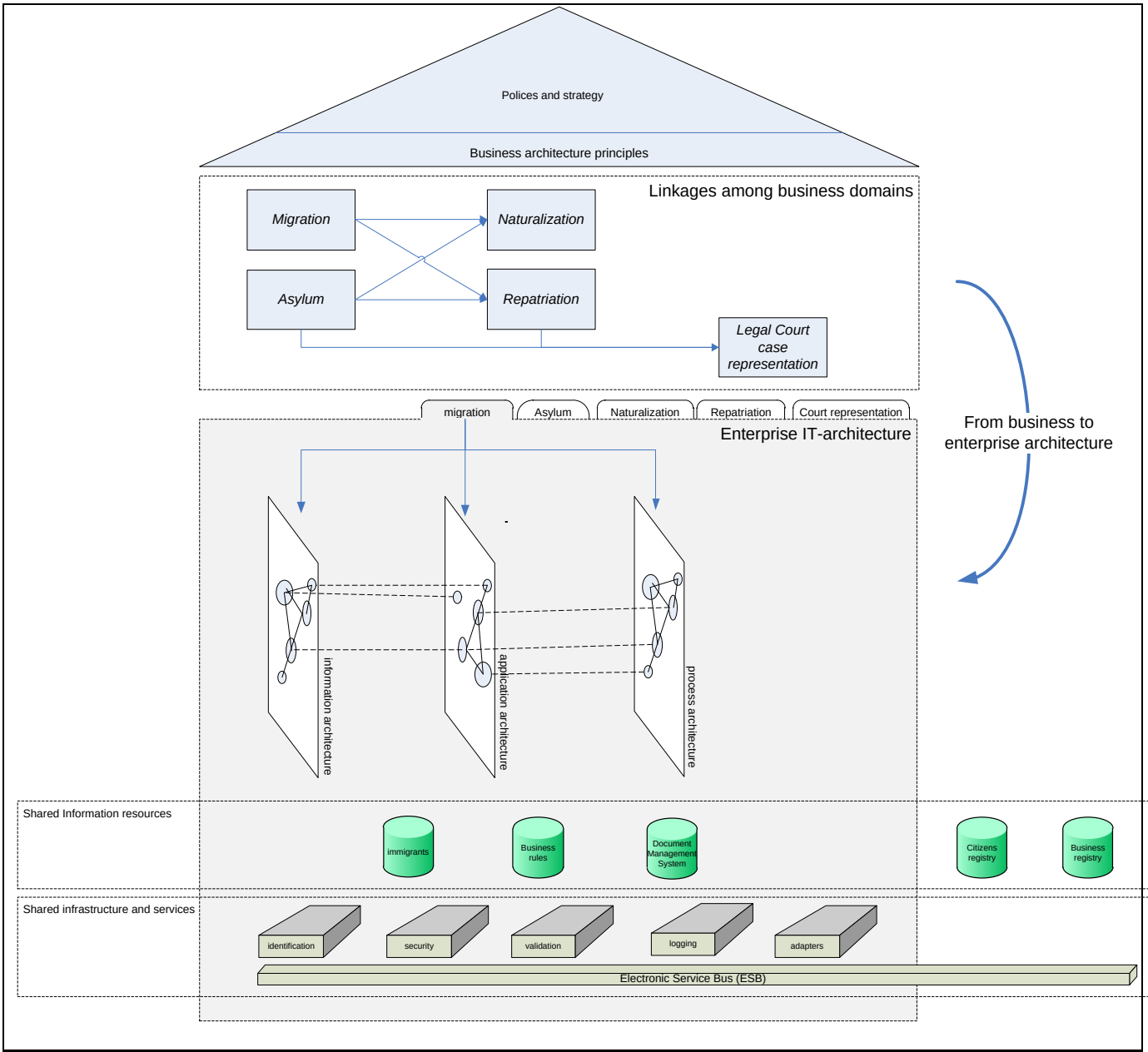

Figure 2. From Business Architecture to Enterprise IT Architecture

event that is communicated to the applicant (Residence Permit Granted). After applicants have moved to the Netherlands, they need to register their new address at the citizens' registry operated by the municipality in which they reside, which triggers an event (Registration in Citizen Registry) that is communicated to the INS.

Application Architecture

Although the business domains are independent, they are all supported by a single business process management (BPM) system which can support a variety of processes. Changes in laws and regulations are implemented in a separate decision-making support system, which directs the workflow system to allow for maximum adaptability. Following the first business principle ensures that the business domains are able to manage the knowledge and that the flow can be executed using the common BPM system [Gong and Janssen, 2011]. The second business principle is aimed at directing the sharing of the common BPM system.

The application architecture is described using the Archimate modeling language (e.g., Lankhorst, 2005) in Figure 3. The frontend (at the top of the figure) ensures the delivery of a uniform environment in which users can request or submit information. Figure 2 shows that the system depends to a large extent on the ESB, which is positioned in the middle of the figure and handles the interaction with other organizations. The search application can be used to query a variety of information sources. The knowledge application stores and provides the rules governing knowledge. The BPM system ensures the execution of business processes, while the Document Management

System (DMS) is used to store and retrieve documents. Finally, the document generator is used to produce (e-) documents that can be sent to civilians or other organizations.

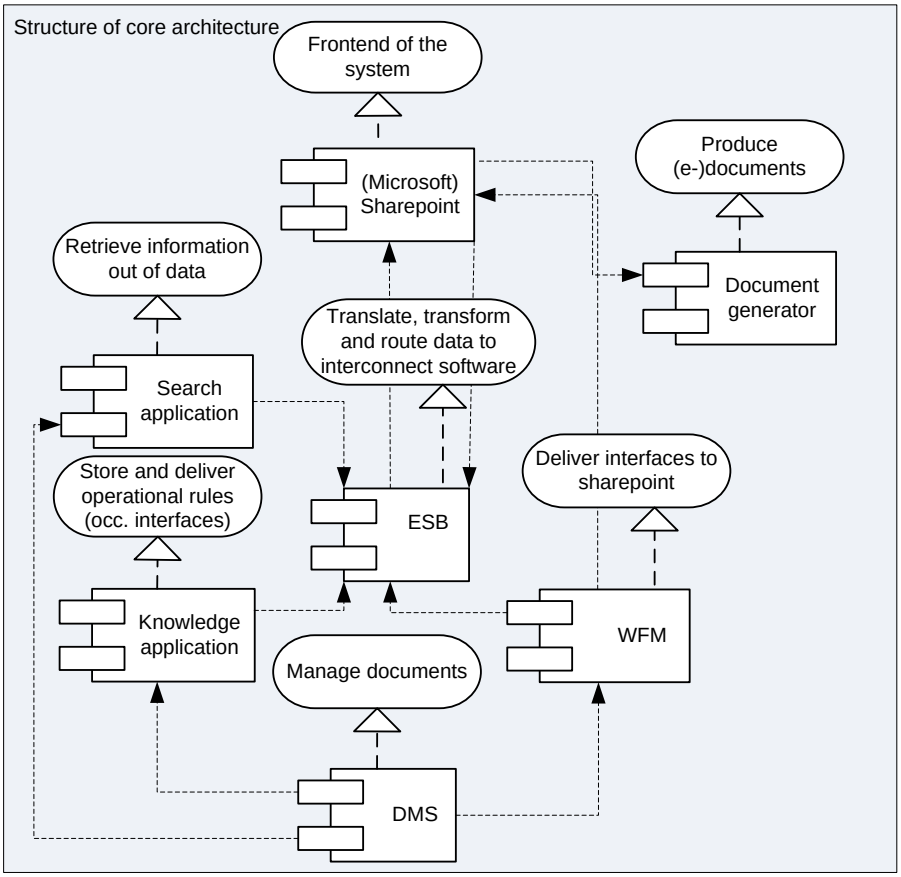

Figure 3. Application Architecture

Information Architecture

Although at present some of the information that is stored is redundant, current thinking is that it is necessary to move toward registries that contain the basic information operated by stewards as guided by the third business principle. Information that is already stored in the National Registries or other standard registers should preferably not be stored again elsewhere, which creates the potential for confusion, but rather be obtained from those registers. This would be possible only if the National Registries were to be accessible, efficient, and reliable, at which point there would be no need to ask an applicant for information that is already available in National Registries, such as the citizens' registries operated by the municipalities or the foreign nationals' registry operated by the INS.

Municipal registries are official registries that store basic information regarding citizens based on the principle of information stewardship, requiring all other parties to use the information stored in these registries. At the moment, the foreign nationals' registry does not yet have this status. It is used to determine and manage the unique identity of foreign nationals. The information in this register is linked directly to individual people and business processes. There are five (sub)registries: the Biometric, Personal, Card, Status, and Procedure (= Referral) and Document registers. The information can be accessed and updated using the application architecture presented in the previous subsection.

Shared Infrastructure and Services

The fourth business principles is used to ensure that all IT is supported by a common IT infrastructure providing the connectivity and basic services that are used in all business domains, including identification and authentication. It is essential for the INS to have an infrastructure that will support and not limit its (future) flexibility, meaning that scalability, flexibility, and availability are requirements for its operation. The interoperability of the systems depends to a large extent on the ESB, which translates, modifies, and routes data between applications. The infrastructure offers failback (the ability to roll back or finish incomplete transactions) and failover (the ability to take over malfunctioning components; redundancy is necessary here) solutions. In addition, a large number of basic services that provide access to the information are defined, as discussed in the information architecture section. The basic

Communications of the Association for Information Systems

idea is that the shared infrastructure and the additional services are independent of legislative, strategic, and social changes.

VII. DISCUSSION AND IMPLICATIONS

The case study shows that the business architecture defines the business domain, which should ensure that legislation can be implemented in each domain independently of others. The independent design and operation of business domains improves the adaptability to and compliance with new legislation. The business principles are aimed toward ensuring that business domains are loosely coupled and that synergies among the domains are accomplished by guiding them at a high level of abstraction. In this way the business architecture helps to clarify the relationship between the strategy of the INS and the way the enterprise IT architecture is organized, in terms of its business processes, applications, and information architecture. The main benefit seems to be that the business architecture manages the complexity and provides a coherent set of principles which ensure agility and adaptability and enable the accomplishment of the integration of the domains, in this way taking advantage of the possible synergies. While maintaining a high level of abstraction, the business architecture is not affected by day-to-day operations or project implementations. In the case study the business architecture is more sustainable than the enterprise IT architecture, which is changed on a regular basis (see below). The use of the business architecture is aimed toward preventing the fragmented development of the enterprise IT architecture. In addition, the business architecture has helped to shed light on the structure of and overlap between various business domains, making it possible to identify a shared infrastructure that is able to deal with the specific requirements within the various business domains.

In contrast to our previous work [Versteeg and Bouwman, 2005] and common conceptions in literature [Perks and Beveridge, 2002], our case study shows that business architecture is sometimes detached from enterprise IT architecture. The IT-oriented enterprise architecture within the INS is captured by the process, application, and information architecture, the design of which is informed by the business architecture. The business architecture was founded in five business domains and based on six business principles. The high-level policies were the *starting* point for the business architecture and were used to define the responsibilities regarding the structure within domains. In this way the business architecture allowed for the making of trade-offs at the strategic level. The business principles provided guidance on how certain trade-offs should be made and which direction is favored, which goes beyond strategic statements by the INS (for example, becoming customer-friendly) that focus on “what” should be done. The principles of the business architecture focus on the “how” questions, i.e., they also provide direction on how actions should be carried out. In this way, the principles of the business architecture mediate between the strategic level and the enterprise IT architecture. Arguably, a focus on how to do things makes the business architecture less sustainable over time. By focusing instead on general principles that are independent of technology and implementation, this drawback has been remedied.

The relatively independent business domains are integrated based on an event-driven orchestration. Events are exchanged among the business domains, and each business domain can take the appropriate actions, which often starts by collecting more information about the events, as events are thin interfaces that do not contain elaborate information. In this way, it is only the events that integrate the various domains, and new events can easily be added or replaced in response to changes in the environment. Events can trigger actions in a business domain that uses applications to collect information and support the workflow and the shared infrastructure and services. The basic building blocks that are nearly impervious to change are the business domains, the events, and the shared infrastructure and services. They provide the long-term foundations, whereas the other architectures (process, information, and application) have to be modified regularly in response to changes in laws and regulations.

The use of a business architecture can benefit both public administrators and IT departments. Business architectures should provide insight into the consequences of the individual statements (or principles) as well as the way in which they are related. The latter is important in order to avoid discussions about the prioritization of principles at a later stage, which would result in questioning the business architecture. In this way, a business architecture ensures that policies are better formulated and understood as well as made more consistent internally. In the case study the business architecture ensured that the necessary flexibility was created by defining relatively independent business domains, whereas at the same time the principles ensured that synergies among the business domains were accomplished. As such, business architecture provides a much better foundation for the subsequent architectures than do the individual statements themselves.

The case study shows that a complicating factor in creating a business architecture can be the large number and diversity of stakeholders who need to be involved and who all have their own ideas and requirements. Relevant stakeholders in our case study include organizational stakeholders, such as public managers, policy makers (interpreting legislation), administrative staff, enterprise architects, IT staff, and external stakeholders like politicians, ministerial policy makers (making or changing laws), embassies (which often are a first point of contact for

immigrants), municipalities (providing shelter and registration in the citizens' registry), the police (responsible for repatriating immigrants), asylum shelters (providing shelter for people requesting asylum), etc. The involvement of all these actors makes it hard to develop a business architecture, because they all want to see their own view represented in the business architecture. Ideally, the business architecture is agreed on by all the stakeholders, which means that all organizational members, but also members outside the organization, should agree on and commit to the principles. Especially policy makers at the Ministry level and partner organizations with whom there is frequent interaction on a daily basis should also be involved in the design of a business architecture. This broadens the scope of the effort involved. We found that it proved difficult to reach an agreement on the appropriate level of detail among the various stakeholders. Some people tended to remain too abstract, whereas others wanted to include every detail and exception. The risk of the latter approach is that the business architecture becomes a thick document that is difficult to understand, is no longer sustainable, and is likely to overlap to a considerable extent with the enterprise IT architecture.

Apart from being policy- and strategy-based, a business architecture for public sector agencies should capture and represent the public values of society. Public values connect citizens to the world of politicians and administrators. For example, the principle of transparency is inspired by the Dutch e-Citizen Charter and represents societal expectations. By making sure the business architecture is transparent, social values are included. Although this principle was not used to guide the design of the enterprise IT architecture, it is relevant because it guides the way in which staff should operate and to whom which information will be made available. It sets the constraints which the enterprise IT architecture has to fulfill.

One of the major issues is how detailed a business architecture needs to be. There should be a reasonable level of detail that guides efforts to create the enterprise IT architecture while at the same maintaining a level of abstraction that renders the business architecture relatively impervious to day-to-day practical changes. Most likely, the level of detail will depend on the nature of the business and activities. The following levels of abstraction can be distinguished.

1. Strategy: this level includes the organization's mission, visions, and other ambitions, often including policies and strategic statements that provide direction at a high level.
2. Business architecture: these are the high-level business decisions that guide the design of the enterprise IT architecture, with a primary focus on providing the starting points for (and constraining) the efforts of the architects. On the other hand, the business architecture provides the freedom to design business domains independently of each other.
3. Enterprise IT architecture: this level contains the models of the structure and its relationships, including the various views on the architecture. Usually, there is a descriptive and a prescriptive element, including a growth path, in contrast to the business architecture, which is entirely prescriptive in nature. The enterprise IT architecture concerns the real activities of the architectures, connecting the previous level (strategy/ business) and the next level (implementation). In one sense, it further constrains the implementation level.
4. Architecture implementation: the guidelines, blueprints, and models of specific projects.

The business architecture plays a pivotal role in translating strategy to the enterprise IT architecture level. The business architecture is more stable and long-term oriented, whereas the enterprise IT architecture is updated based on the experiences of implementation projects, the outcomes of projects (i.e., the realization of one part of the enterprise IT architecture), the emergence of new technologies, etc.

In this article, the business architecture of a single organization was analyzed and transformed into a loosely coupled network organization. A recommendation for a next step is to extend and analyze business architectures for a chain or extended network of organizations. The question is whether an organizational network should have a single business architecture (agreed on by all the parties involved) or whether each organization should have its own architecture and define only their interfaces. The question that needs to be answered in this respect is whether the business architectures of multiple organizations can be used in parallel or whether there should be an overarching business architecture capturing elements of multiple chains and networks.

VIII. CONCLUSIONS

A business architecture is a relatively stable architecture based on an organization's mission, ambition, and social values, and it results in a number of business domains and principles. In our case study the business architecture is a mediating instrument between the strategic level and the enterprise IT architecture. The different business domains can be designed and operated independently, they are accountable on an individual basis, and they are able to handle external events that trigger certain actions, while the principles provide guidance. This improves the

adaptability to and compliance with new law and regulations. Business domains divide an organization in such a way that it is able to adapt to changing circumstances, which means that changes in legislation (often) influence only one business domain. The case study revealed that the business domains need to be complemented by business principles aimed at integrating the business domains and ensuring that synergies among the business domains are accomplished. The case study further shows that having a business architecture makes it possible to improve the manageability of a complex organization and provides a coherent set of starting points that can be understood by a large, diverse group of stakeholders. Indeed, enterprise IT architecture could be used to accomplish this also, and sometimes business architectures are viewed as being part of enterprise IT architecture. The position of the business architecture gives it a structuring role, and it should be able to provide a level of abstraction that is not subject to day-to-day operations or project implementations. In this way, the business architecture provides long-term stability, which captures the structure and relationships to actually implement the business architecture.

Event-driven orchestration can be used to ensure that the business domains operate in a coherent manner, making it possible to provide customer-oriented services. The loosely coupled business domains are integrated on the basis of events, while technical interoperability is provided by the shared infrastructure. Events trigger actions in the business domains that use applications to collect information and support the workflow, as well as in the shared infrastructure and services. Thus, the basic building blocks that enable the business architecture to function are the business domains, events, and shared services.

Creating a business architecture in e-government involves different complexities from those in the private sector, due to the involvement of many (semi-)autonomous stakeholders and the fact that public values, the political climate, and organizational objectives should be taken into account. Furthermore, the business architecture also has to be realistic and feasible. Future research may focus on the relationship between the business architectures guiding supply chains or organizational networks and on the development of support tools for the design of business architectures.

This article contributes to the limited body of research on business architectures. This study can be described as a qualitative single case study, as the learning experience is investigated with reference to business architectures in a bounded context. The selection of the single case study design brings forth many limitations as far as the generalization of the results of the study is concerned. Nevertheless, understanding this particular case in more depth might help us learn something about more general phenomena. Further research should generalize the findings and facilitate the better understanding of business architectures and enterprise IT architectures.

ACKNOWLEDGMENTS

This work is supported by AGILE project (acronym for **A**dvanced **G**overnance of **I**nformation services through **L**egal **E**ngineering, http://www.jacquard.nl/?m=426).

REFERENCES

Editor's Note: The following reference list contains hyperlinks to World Wide Web pages. Readers who have the ability to access the Web directly from their word processor or are reading the article on the Web, can gain direct access to these linked references. Readers are warned, however, that:

1. These links existed as of the date of publication but are not guaranteed to be working thereafter.
2. The contents of Web pages may change over time. Where version information is provided in the References, different versions may not contain the information or the conclusions referenced.
3. The author(s) of the Web pages, not AIS, is (are) responsible for the accuracy of their content.
4. The author(s) of this article, not AIS, is (are) responsible for the accuracy of the URL and version information.

Andersen, K.V., and H.Z. Henriksen (2006) "E-government Maturity Models: Extension of the Layne and Lee Model," *Government Information Quarterly* (23)2, pp. 236–248.

Arbab, F., et al. (2002) *State of the Art in Architecture Frameworks and Tools*, Enschede, The Netherlands: Telematica Institut.

Architecture Working Group (2000) *IEEE Std 1471–2000 Recommended Practice Architectural Description of Software-Intensive Systems*, Washington DC: IEEE Standard 1471–2000.

Bernard, S.B. (2004) *An Introduction to Enterprise Architecture,* Bloomington, IN: AuthorHouse.

Besson, I., S. Green, and J. Sa (2002) Linking Business Processes and Information Systems Provision in a Dynamic Environment, *Information Systems Frontiers* (4)3, pp. 317–329.

Bruls, W.A.G., et al. (2010) "Domain Architecture as an Instrument to Refine Enterprise Architecture," *Communications of the Association for Information Systems* (27) Article 27, pp. 517-540.

Buckl, S., et al. (2010) *A Conceptual Framework for Enterprise Architecture Design*, Proceedings of the 5th International Workshop on Trends in Enterprise Architecture Research (TEAR 2010), Heidelberg, Germany: Springer, pp. 44-56.

Chandra, C., and S. Kumar (2001) "Industrial Management and Data Systems," *Enterprise Architectural Framework for Supply Chain Integration* (101)6, pp. 290–303.

Chen, H. (2002) "Digital Government: Technologies and Practices," *Decision Support Systems* (34)3, pp. 223–357.

Cragg, P., M. King, and H. Hussin (2002) "IT Alignment and Firm Performance in Small Manufacturing Firms," *Journal of Strategic Information Systems* (11)2, pp. 109–132.

Dhillon, G.S., V. Weerakkody, and Y.K. Dwivedi (2008) "Realising Transformational Stage E-government: A UK Local Authority Perspective," *Electronic Government* (5)2, pp. 162–180.

Doucet, G., et al. (2008) "Coherency Management: Using Enterprise Architecture for Alignment, Agility, and Assurance," *Journal of Enterprise Architecture* (4)2, pp. 9–20.

Gong, Y., and M. Janssen (2011) "From Policy Implementation to Business Process Management: Principles for Creating Flexibility and Agility," *Government Information Quarterly* (28)5 http://www.sciencedirect.com/science/article/pii/S0740624X11000700 (current Sep. 19, 2011).

Grönlund, Å., and T.A. Horan (2005) "Introducing e-Gov: History, Definitions, and Issues," *Communications of the Association for Information Systems* (15) Article 39, pp. 713–729.

Hammer, M., and J. Champy (1993) *Re-engineering the Cooperation: A Manifesto for Business Revolutions*, New York, NY: Harper Business.

Hedman, J., and T. Kalling (2003) "The Business Model Concept: Theoretical Underpinnings and Empirical Illustrations," *European Journal of Information Systems* (12)1, pp. 49–59.

Henderson, J., and N. Venkatraman (1993) "Strategic Alignment: Leveraging Information Technology for Transforming Organizations," *IBM Systems Journal* (32)1, pp. 4–16.

Hoogervorst, J. (2004) "Enterprise Engineering and Architectuur: een antwoord op falende strategie implementaties (EE & A: An Answer to Failing Strategy Implementations)," *Holland Management Review* (98)6, pp. 20–31.

Janssen, M., J. Gortmaker, and R.W. Wagenaar (2006) "Web Service Orchestration in Public Administration: Challenges, Roles and Growth Stages," *Information Systems Management* (23)2, pp. 44–55.

Janssen, M., and A. Verbraeck (2005) "Evaluating the Information Architecture of an Electronic Intermediary," *Journal of Organizational Computing and Electronic Commerce* (15)1, pp. 35–60.

Lankhorst, M. (2005) *Enterprise Architecture at Work: Modelling, Communication and Analysis*, Berlin, Germany: Springer-Verlag.

Mathora, Y. (1996) *Enterprise Architecture: An overview,* New York, NY: Brint Institute.

McGovern, J., et al. (2006) *Enterprise Service Oriented Architectures: Concepts, Challenges, Recommendations,* New York, NY: Springer.

Morris, B., et al. (2009) *Business Architecture: A Suitable Basis for Planning and Designing a Business Process Outsourcing Initiative,* Paper presented at the ACIS 2009 Proceedings, Melbourne, Australia.

Nayak, N., et al. (2007) "Core Business Architecture for a Service-oriented Enterprise," *IBM Systems Journal* (46)4, pp. 723–742.

Op 't land, M., et al. (2009) *Enterprise Architecture: Creating Value by Informed Governance,* Berlin, Heidelberg, Germany: Springer Verlag.

Overbeek, S., B. Klievink, and M. Janssen (2009) "A Flexible Event-Driven Service-Oriented Architecture for Orchestrating Service Delivery," *IEEE Intelligent Systems*, forthcoming.

Perks, C., and T. Beveridge (2002) *Guide to Enterprise IT Architecture,* New York, NY: Springer.

Richardson, L., B.M., Jackson, and G. Dickson (1990) "A Principle-Based Enterprise Architecture: Lessons from Texaco and Star Enterprise," *MIS Quarterly* (14)4, pp. 385–403.

Ross, J.W. (2003) "Creating a Strategic IT Architecture Competency: Learning in Stages," *MISQ Quarterly Executive* (2)1, pp. 31–43.

Schekkerman, J. (2003) *How to Survive in the Jungle of Enterprise Architecture Framework: Creating or Choosing an Enterprise Architecture Framework,* Bloomington, IN: Trafford.

Schmidt, C., and P. Buxmann (2011) "Outcomes and Success Factors of Enterprise IT Architecture Management: Empirical Insight from the International Financial Services Industry," *European Journal of Information Systems* (20)2, pp. 168–185.

Sheng, Q.Z., B. Benatallah, and Z. Maamar (2008) "User-Centric Services Provisioning in Wireless Environments," *Communications of the ACM* (51)11, pp. 130–135.

Teo, T.S.H., and J.S.K. Ang (1999) "Critical Success Factors in the Alignment of IS Plans with Business Plans," *International Journal of Information Management* (19)2, pp. 173–185.

TOGAF (2009) "The Open Architecture Framework Version 9.0," February, www.opengroup.org/togaf (current Feb. 2011).

Turban, E., E. McLean, and J. Wetherbe (2004) *Information Technology for Management: Transforming Organizations in the Digital Economy,* New York, NY: Wiley.

Valtonen, K., and M. Leppänen (2009) "Business Architecture Development at Public Administration—Insights from Government EA Method Engineering Project in Finland," In Papadopoulos, G.A., et al. (eds.), *Information Systems Development: Towards a Service Provision Society,* Berlin, Germany, New York, NY: Springer Verlag, pp. 765–774.

van Diepen, T. (2000) "Impact of Electronic Distribution Channels on the Internal Organisation: Multi-channel Distribution in Financial Service, *TIC* (6)1, pp. 37–60.

van Rensburg, A.C.J. (1997) "An Object-oriented Architecture for Business Transformation," *Computers and Industrial Engineering* (33)3–4, pp. 167–170.

Veasey, P. (2001) "Use of Enterprise Architecture in Managing Strategic Change," *Business Process Management Journal* (7)5, pp. 420–436.

Versteeg, G., and H. Bouwman (2005) "Business Architecture: A New Paradigm to Relate Business Strategy to ICT," *Information Systems Frontiers* (8)2, pp. 91–102.

Weerakkody, V., and G. Dhillon (2008) "Moving from E-Government to T-Government: A Study of Process Re-engineering Challenges in a UK Local Authority Perspective," *International Journal of Electronic Government Research* (4)4, pp. 1–16.

Wolfenden, P., and D.E. Welch (2000) "Business Architecture: A Holistic Approach to Defining the Organization Necessary to Deliver a Strategy," *Knowledge and Process Management* (7)2, pp. 96–106.

Zachman, J.A. (1987) "A Framework for Information Systems Architecture," *IBM Systems Journal* (26)3, pp. 276–292.

ABOUT THE AUTHORS

Harry Bouwman is a Finnish Distinguished Professor at IAMSR, Åbo Akademi University, Turku, Finland, and an associate professor at ICT Section, Faculty Technology, Policy and Management, Delft University of Technology, The Netherlands.

Harrie van Houtum has several decades of experience in ICT-driven public sector innovation and have been employed by several large public agencies.

Marijn Janssen is the director of the interdisciplinary SEPAM Master Program and an associate professor within the Information and Communication Technology section of the Technology, Policy, and Management Faculty of Delft University of Technology.

Gerrit Versteeg is managing partner/business architect for Four-Points Intelligence and has almost twenty years of experience in designing architectures for a variety of large customers.

Communications of the Association for Information Systems

ISSN: 1529-3181