Enterprise Architecture for Business Networks: A Constructivist Synthesis

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Abstract

A current limitation in Enterprise Architecture is to establish the adequacy of the modelling and analysis for dedicated business network planning to capture related artifacts. Much of the focus is on the modeling of interactions across organisations through coordinative artifacts such as processes, services, and resources. Thus, an analysis of how artifacts are shifted, as a whole, across partners, is only available in a limited range of interaction contexts. To overcome these issues, this paper develops constructivist insights by way of the key network planning requirements observed in common situations in business networks including headquarter-subsidiary, business network orchestrator, and virtual organisation configurations. These requirements are discussed through a complex network application in the EGovernment domain, namely One-Stop Shop, citizen-centric service delivery. An analysis of these requirements is provided as illustrative extensions for the ArchiMate language to support the business network context.

Keywords

Business networks, enterprise architecture, resource definition, capabilities, ArchiMate, role constraints.

INTRODUCTION

IS modeling and architecture methods have become indispensable for systems planning, analysis, design, and implementation. While the focus of systems modeling, at a detailed level, has been on single organizations, many proposals have developed higher-level, contextual modeling for the cross-organisational perspective. Prominent examples include business process choreography modeling (Ko, Lee, & Lee, 2009), service networks (Razo-Zapata, De Leenheer, Gordijn, & Akkermans, 2012) and virtual organisational modelling (Ahuja & Carley, 1998). Enterprise architecture (EA) methods (Bernus, Nemes, & Schmidt, 2003) are of particular interest because they combine a variety of available modeling concepts and techniques, encompassing several types of organisational artifacts, which are integrated through a core meta-model and are required to support business and IT viewpoints.

Despite the plethora of EA methods and specialised techniques for cross-organisational modelling, a major uncertainty remains about the adequacy of modeling and analysis for dedicated business network planning. Much of the focus is on the modeling of interactions across organisations through coordinative artifacts such as processes, services, and resources. As an example, process choreography modelling (Hettel, Flender, & Barros, 2008), across the business process perspective is modeled based on message (data) exchanges between processes. Thus, an analysis of how artifacts are shifted, as a whole, across partners, to leverage the improvements and opportunities opened up through participation in networks, is only available in a limited range of interaction contexts. Thus, an understanding of the full impact of artifacts deployed through new arrangements introduced by networks, such as understanding the feasibility of offsetting existing artifacts through third-parties for efficiency gains and new innovations, and the creation of virtual enterprise structures out of existing artifacts, remains limited. This paper sheds light on extensions for enterprise architecture to support conceptual business network modeling and analysis supportive of key network planning requirements.

The remainder of the paper proceeds as follows, First, it develops constructivist insights (Falkenberg. et al., 1998) by way of the requirements observed, in common situations (manifestations) of business networks and common artifact impacts. These situations include *headquarters-subsidiary* (Kobrin., 2013), *business network orchestrator* (Busqutes, 2010), and *virtual organisation* (Mowshowitz, 1997). Two artifacts impacts, derived from the network situations, are considered, namely artifact *alignment* and artifact *extension*. Given space limitations, we focus on resources and services only, referring the reader the complete set of network planning requirements in (Bakhtiyari, Barros & Stewart 2014). The requirements for network planning are discussed through a complex network application in the EGovernment domain, namely One-Stop Shop, citizen-centric service delivery (Palvia & Sharma, 2007; Sharma, 2006). We then develop illustrative extensions based on ArchiMate, the architecture development method of TOGAF, the most widely used EA framework.

REQUIREMENTS ANALYSIS FOR ARTIFACT-CENTRIC BUSINESS NETWORK PLANNING

In order to capture the list of requirements, a constructivist approach was adopted where individuals construct the meaning of events. Further, Mir and Watson (2001) state that in constructivism, rules and principles do not exist independently of our theorizing about them therefore; the constructivist view does not question the existence of phenomena, but rather the ability to understand them without a specific theory of knowledge.

We develop key requirements for business network planning, drawn from insights into how artifacts are affected in a number of formative aspects of networks, or as we refer to them, "*network situations.*" These situations resonate with business network structures (Camarinha-Matos & Afsarmanesh, 2011) and, as such, provide cognitive contexts for concretely understanding network planning. To provide insights into these situations and the requirements drawn through these, we describe a complex network relating to EGovernment service provision.

One of the most prevalent network situations arises from the "*headquarters-subsidiary*" relationship, used to structure company networks, such as multi-nationals, where the precedence of company ownership leads to a parent company applying policy and regulatory practice for separate and typically geographically distributed subsidiaries it owns. Central regulation can include common product and service portfolios across the parent and subsidiaries, revenue and accounting flows, and governance processes (Schmid & Schurig, 2003). At the same time, subsidiaries develop and expand business within their particular operating domain and charter. The key characteristic of central regulation lies in the constraint of certain resources, processes, services, and information shared between a parent and subsidiary, as well as between subsidiaries. This results not only in a certain standardisation of practice but on constraints across artifacts, e.g. a separation of duties between resources across different parties for processes coordinated across them (Tamm, Seddon, Shanks, & Reynolds, 2011). Thus, a headquarters-subsidiary situation offers important insights into how related artifacts align, interact, or are offset by each other.

The growth of business networks has led to a focus on coordinative aspects and with it the notion of the "*business network orchestrator*", which we enlist as another network situation. As seen through supply chains among other examples, this form of inter-organisational relationship is exemplified when a coordinating entity (e.g. a third-party logistics provider) and other parties (e.g. transportation carriers), work cooperatively together to fulfil common business objectives, typically related to customer demand, without necessarily having any shared ownership or governance regime. The orchestrator serves to integrate capabilities through outsourcing or insourcing across the network, and through common process, service and resource interactions (Rodon, Busquets, & Christiaanse, 2005). A business network orchestrator situation offers important insights about how artifacts interact, across organisational boundaries, through the operational perspective of the orchestrator.

A "*virtual organisation*" situation arises from a specialised network arrangement where a, typically temporary, collective is created out of independent parties to address timely business opportunities in the face of resource scarcity (Browne & Jiangang, 1999). Participating entities form a virtual organisation in order to provide capabilities supported through existing artifacts of the coordinating parties. In order words, resources, processes, services and information offered through a virtual organisation are aligned to concrete artifacts in the supporting parties. This is a distinguishing feature of this situation (Tae-Young, Sunjae, Kwangsoo, & Cheol-Han, 2006). It contrasts with the headquarters- subsidiary situation, where distinct artifacts operate and align across all parties - the parent company and subsidiaries. We note that, in reality, network structures addressing resource scarcity make use of both real and virtual artifact alignments, thus incorporating both the headquarters-subsidiary and virtual organisation situations in their enterprise structure.

To develop concrete requirements, based on insights from the business network situations described in the previous section, for business network planning, we focus on the key factors of network planning that apply to enterprise artifacts. To date, proposals for cross-organisational modelling techniques have focussed on how artifacts such as processes and services interact across partners in a network. In the sections below, we focus on two new considerations – *extension* and *alignment* – and specific constraints related to these.

Extension of enterprise artifacts

A key observation we make concerning the use of organisational artifacts from the business network orchestrator and headquarter-subsidiary situations is that they are either adapted for new requirements arising from the extended network setting, or they are shifted into new forms and operations available through the network and new partners. For example, a network opens up the supply of services available from different partners in the network. Services could then be aggregated into value-added composites, e.g. through data correlators (service mashups), process flows (service composites) and groupings focussed on market opportunities (service bundles). Service aggregators are prominent business entities that combine existing services and deliver these through new markets. Accordingly, service methods and languages support different forms of service aggregation and different types of service entities are prominent in a service network (Oberle, Barros, Kylau, & Heinzl, 2013).

Resource extension is also prominent in business networks. This includes resource augmentation (where existing resources and work teams are bolstered with additional resources from the network with a particular focus on resources with unique or scarce skills and capabilities), resource substitution (where local resources are replaced with more experienced/higher performance/lower cost network resources), resource specialisation (where non-core activities and services are reassigned to network resources allowing local resources to focus on their core competencies) and resource consolidation (where local resources are recombined into alternative work units possibly with additional network resources and the work distribution strategy is realigned to the capabilities provided by these new work units). Various approaches to resource definition and work distribution, focussed mostly in the context of single organisational business processes, have been proposed, e.g. (Russell, ter Hofstede, Edmond, & van der Aalst, 2005).

> ***Extension of enterprise artifact requirement:*** *An EA method should support the extension (reuse and change) of organisational artifacts (resources, services, processes and information), beyond their original ownership and provisioning boundaries, by external partners in a business network. The extension of the artifact entails changing its functional and non-functional characteristics while retaining its core (irreducible) part. The extension should abide by constraints related to the original artifacts.*

This requirement addresses the capacity, innovation, and new opportunities available through business networks and "third-parties" to extend the capabilities of existing artifacts, diversifying their value. The core capabilities associated with the artifact are retained, not displaced, even where a new artifact is produced. The original artifact is, indeed, extended, as opposed to being entirely transformed, which would effectively result from the creation of the new artifact "from scratch."

Alignment of enterprise artifacts

The virtual organisation network situation, with its focus on creating organisational structure out of pre-existing artifacts, draws attention to the need for aligning virtualised artifacts in the virtual organisation with concrete ones from existing organisations (Jung, 2008). This can be seen through one of the most common forms of virtual organisations, in the retail and other customer facing operations of networks, where resources in designated roles of shop fronts, service desks and the like, are drawn from resources in other organisations that support the formation of a virtual organisation. Alignment of other organisational artifacts such as services, processes and information can occur through the creation of corresponding virtual artifacts (i.e. services, processes and information defined at the level of the virtual organisation) or indirectly, through resources. In other words, by virtualising resources, the artifacts that the concrete resources have that underpin them, may also be virtualised (i.e. externally exposed for transparency of operations undertaken by resources in the virtual organisation). While resource, service and process modelling techniques have been proposed for support of cross-organisational applications including virtual organisations (Gou, Huang, Liu, Ren, & Li, 2000), explicit support of artifact alignment is not available.

> ***Alignment of enterprise artifact requirement:*** *An EA method should support the alignment (strict reference to) organisational artifacts (resources, services, processes and information), beyond their original ownership and provisioning boundaries, for virtualised use in the business network. The aligment of the artifact entails change to the organisational context in which the artifact is used, but not changes to its functional and non-functional characteristics. The alignment should abide by constraints related to the original artifacts. New, virtualised artifacts created as part of the organisational context should refer to existing artifacts.*

This requirement addresses the capacity, innovation, and harnessing of new opportunities available through business networks and "third-parties" to extend the distribution of capabilities of existing artifacts, diversifying their value, without changing the artifacts. It should be noted that while virtual organisations form a larger organisational context for the virtualisation of operations based on existing artifacts, networks of headquarters-subsidiary and business network orchestrators could have smaller organisational contexts (e.g. projects, individual lines-of-business) in which available artifacts are virtualised.

Requirements features of artifact use

When organisational artifacts are used across networks through "third-party" extension or virtualisation/alignment, as described in the EA method requirements above, we identify the need for constraining how artifacts can be extended. This, in turn, supports provenance, which becomes a significant issue for confirming the authenticity of a specific instance of a reused artifact and tracing its evolution from an original version, with a view as to how it has been extended or deployed. For example, in procurement scenarios, after creating a new interface for a service such as purchase requisition through a B2B gateway, the new interface is mapped to an existing service interface. The new interface can be used in wider supply chains where partners interact on the basis of specific B2B standards and aggregate services with other services. The original service provider providing core capabilities of services continues to carry core capabilities for delivery. As the service gets progressively extended, the risk of degrading service delivery increases. To mitigate against risks associated with extending or virtualising organisational artifacts, we define the following resource constraints in Table 1. These have been adapted from the service dependency constraints proposed in USDL (Oberle, et al., 2013).

Table 1: Role & service constraints extensions: a proposal for ArchiMate

Artifiacts Constraint	**EA Artifacts Requirements**	**Resource Constraint Definition**	**Service Constraint Definition**
Includes	Alignment	Identifies that that some or all of the resources in a given role possess the capabilities required to perform an activity to the same standard as the resources comprising the referenced role. Consequently, the population of the referenced role overlaps with the population of the given role in terms of the capabilities of its members.	Operation of the service, service bundle or abstract service entails the operation of the referenced service, service bundle, abstract service, or resource; the referenced object is part of the service, service bundle or abstract service and does not need to be procured by the consumer
Enhances	Extension	N/A	The service, service bundle or abstract service provides additional capabilities (functionality) on top of the referenced service, service bundle or abstract service
CanConflictWith	Extension and alignment	In essence, the canConflictWith constraint identifies that the population of a given role has a range of capabilities that are incompatible with those specified for the population of the referenced role.	Operation of the service, service bundle or abstract service may conflict with the operation of the referenced service, service bundle or abstract service
CanSubstitute	Extension and alignment	Identifies that a member of the population of a given role has equivalent capabilities to one or more resources comprising the referenced role and that a member of the referenced role can be substituted with a member of the given role in a specific service instance without loss of generality.	The service, service bundle or abstract service defines capabilities (functionality) that are different from those of the referenced service, service bundle or abstract service, but it achieves the same goals and therefore constitutes an alternative to the referenced object
Mirrors	Alignment	Identifies that the population of a given role has equivalent capabilities to the resources comprising the referenced role and vice versa.	The service, service bundle or abstract service defines the exact same capabilities (functionality) as the referenced service, service bundle or abstract service, thus constituting an alternative to the referenced object
Requires	Extension and alignment	Identifies that the capabilities possessed by resources in a referenced role are mandatory in order to deliver the capabilities required of the resources comprising the given role. Consequently the population of the referenced role forms part of the overall population of the given role and its resources have at least the same capabilities as those in the given role.	Operation of the service, service bundle or abstract service depends on the operation of the referenced service, service bundle, abstract service, or resource; consequence is that the referenced object has to be made available by the consumer (i.e. has to be ordered separately)

ILLUSTRATIVE EXTENSIONS THROUGH ARCHIMATE

ArchiMate is an EA method for enterprise architecture, adopted by TOGAF (The Open Group Architecture Framework), combining different modelling techniques for supporting the capture of organisational artifacts and their interactions, across business, application, and IT infrastructure layers. Figure 1 provides an example of the main concepts of ArchiMate. It depicts: a model for an organisational structure capturing actors/roles and their hierarchical relationships (top left); a collaboration model capturing the landscape of domains that roles interact with and domains linking detailed models (top right); a set of integration models layered across business, IT application and IT infrastructure (central part of the figure), each capturing key scenarios in terms of actors and roles, services (rounded rectangles) and alignments with supportive processes (directed, dashed lines), processes (rectangles) and flows (solid, directed lines); and detailed solution architecture models such as data models (bottom right)

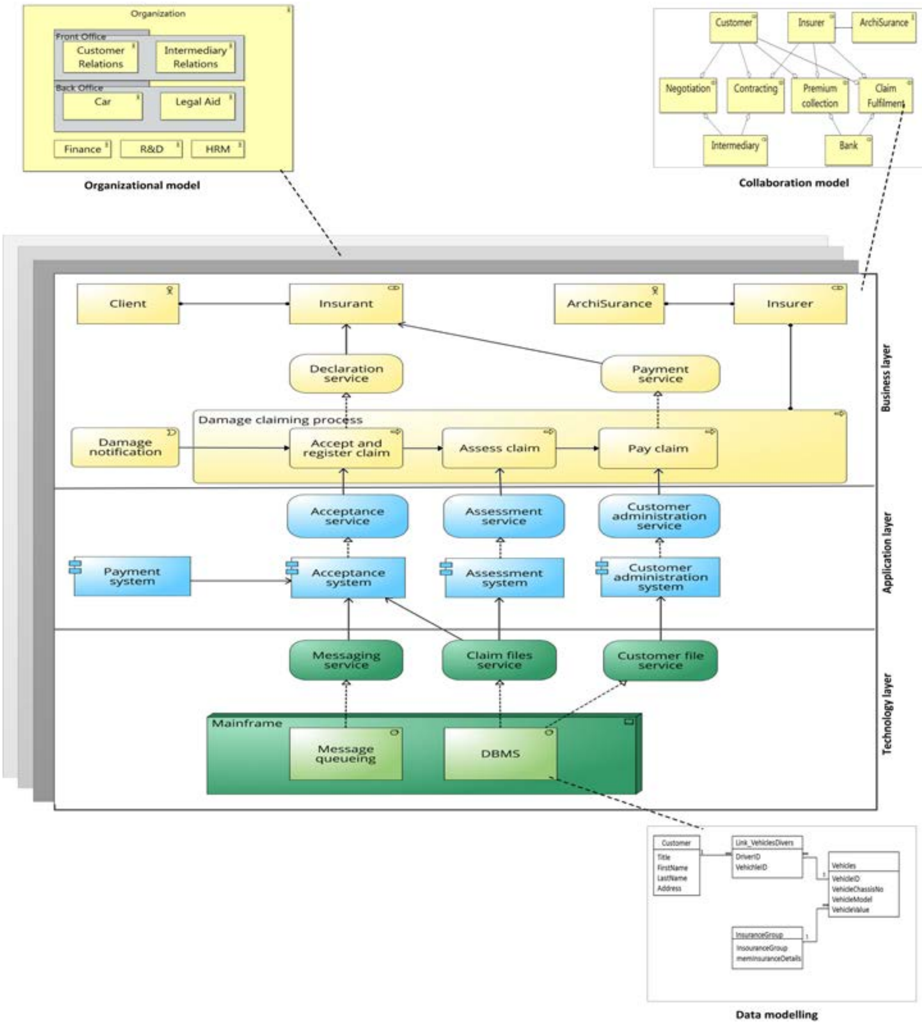

Figure 1: Main concepts of ArchiMate

Case study: Egovernment One-Stop Shop

The One Stop Shop (OSS) concept (Government, 2013) is an EGovernment strategy aimed at customer-oriented service delivery across multiple channels, service providers, and systems, removing government stovepipes and inefficiencies which require customers to navigate across separate government agencies to meet their needs. The strategy is aimed at increasing efficiency, consistency, self-reliance and trust of citizens accessing the diverse range of services provided by the government. Significant international examples, which include UK Direct Gov (UKOnline), Hong Kong Online, USA.gov, and Service Canada, highlight similarity of vision and goals, a variation of approaches and stages of maturity, and complex operational and technical frameworks to materialise the OSS vision. Key capabilities include the ability for citizens to: discover services relevant to their needs and contexts [1]; access and consume services across multiple channels; have consistent but also personalised interactions with services, regardless of the provisioning agency; and make payments and track service progress through to fulfilment. We have conducted a detailed case study of One-Stop Shop requirements and design in the context of customer facing channels (CRC, 2014). Figure 2 provides a high-level depiction of an OSS framework as developed through our analysis. This framework brings into view the key actors and broad interactions between them. On the right-hand side of the figure are government service providers (e.g. transportation, education, health and lands departments) which provide exposure of their services through the OSS framework, meaning that while they run inside business and IT environments assigned by the providers, they are discoverable, accessible and can be tracked and paid for through other components of the framework. To centralise service delivery mechanisms, providers need to publish services into a central directory through the OSS framework and allow services to be integrated through the framework with “backend" systems. Certain parts of service delivery, such as payment, need to be offset through central payment engines, which allows service fees to be collected and passed onto providers and other parties involved in their delivery.

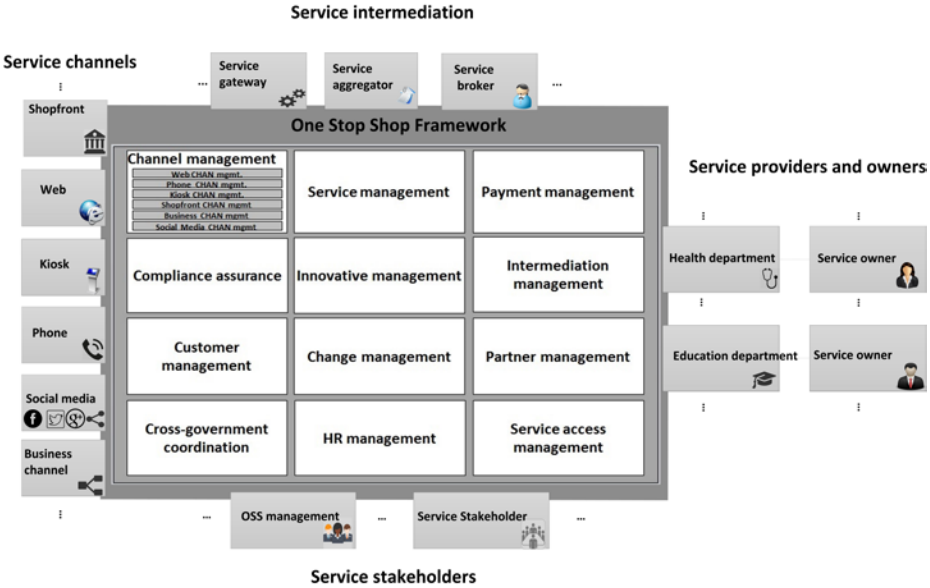

Figure 2:One-Stop Shop framework overview

On the left-hand side of Figure 2 are the various central channels which allow different services to be accessed by citizens. These include call centres, service centres (shop-fronts), web sites (typically supporting different customer segments, e.g. general, aged, parents and child care, business) and private sector outlets (e.g. land developers and banks can drive dedicated channels for accessing services associated with their businesses). With technological advances, mobile and, increasingly, social media sites, are quickly emerging as popular channels for service consumption. For such diverse, multi-channel service delivery, channel providers need to “plug into" the OSS framework and demonstrate front-end service delivery competence. In addition, service providers need to ensure that their services can be flexibly presented to the distinct presentation applications used by different channels, and that different channels can be used for delivery of the same, long-running service instance through different sessions. At the bottom of Figure 2 are service stakeholders, who are not directly involved in service delivery, but have a designated role in the particular network of specific services, e.g. national directory providers who need to reflect services exposed at state or local government levels, would provide access to descriptions of those services exposed through the OSS framework.

Through this background, the OSS framework draws together a network of different actors, and a number of different network situations can be observed, as follows:

– The OSS framework and its relationship with the different actors have a form of *headquarters-subsidiary*, in that a lead agency coordinates the definition, implementation, and regulation of the OSS with the different actors (service providers, channel providers etc.). The OSS framework provider, as such, regulates what interactions take place through the framework and how they are supported, e.g. OSS channels replacing provider specific channels and the line of separation between interactions that take place between customers and channel operators, and customers and service providers; similarly the

[1] These may be concrete in nature, like obtaining a driver's licence, or more abstract, like dealing with the discovery of a toxic weed in the garden, presenting uncertainties about which services or agencies are relevant. Contexts may be closely related to customer stage of life, for example life events as the birth of a child, leading to the need for a variety of related and ongoing services.

use of a central broker for service discovery and access and how its alignment with service provider operations; and the use of a central payment engine.

- A business *network orchestrator* can be seen between mediators such as central brokers and channel providers and 'backend' service providers. An interaction model illustrates this: customer requests are triggers by customers to channels and a broker is used by the channel to determine which service(s), areas or personnel are required. When services are requested, triggers are made on the broker, through which services are instantiated and the relevant interactions are made with 'backend' service providers. Through each interaction cycle, an invocation is sent to a provider and a response is returned, prepared for presentation through the requesting channel, and forwarded on. Certain interactions trigger payment steps, which are also orchestrated through a broker. Thus, the broker provides a hub-spoke coordination of service interactions, triggered through channels and forwarded to service providers.
- A *virtual organisation* could apply for specific channels which are created entirely through resources and processes drawn from service providers. For example, a specific web channel for transportation services could be assembled from the transportation and other related departments, though this channel would be branded and operate as an OSS channel.

The general process for assisted, "front-line" service delivery, as illustrated though the ArchiMate model in Figure 3, first involves processing customer requests through a concierge. The concierge identifies keywords from the initial discussion with a customer and chooses one of the following approaches to process the request: a guided dialogue (script), a local (domain specific) service discovery tool, a global (domain non-specific) service discovery tool, a customer service advisor in the channel, or direct agency transfer. The concierge can make use of a customer navigation service inputting the keywords, to determine which path to take. A guided dialogue allows the concierge to follow a structured set of interactions with a customer, which is useful when a concierge is able to identify the general area and possibly the service(s) a customer requires: the dialogue ensures appropriate navigation to trigger services while capturing the information needed. Local service discovery is used when the general area of request can be identified and its navigation rules and information are available through a dedicated tool. Global service discovery applies when there is greater uncertainty about which area applies and/or if no local discovery tool is available. A concierge refers customers to a customer service advisor for detailed discussions about service requests which cannot be resolved through quick checks. Finally, the concierge will provide a direct ("cold") transfer to an agency if the area and/or service are immediately apparent and agencies stipulate that they must control interactions with customers. As discussed above, a customer service advisor provides a second line of customer request processing where more detailed expertise, interactions and information capture are required. As with concierges, the advisor can use the customer navigation service, as well as local and global discovery to resolve requests to services. The advisor can then transfer the request and information to the relevant unit or individual in an agency or he/ she can deliver the service directly, depending on agency stipulated access control. For agency transfers, the advisor selects a notification mechanism (fax, email, call) and for direct service delivery he/she accesses the allocated systems for processing the service, which in turn may entail triggers to roles elsewhere (such as service specialist, agency service coordinator) to undertake work to deliver a service.

The One-Stop Shop concept is based on a number of distinct premises. Perhaps most significantly, there must be the broad requirement across multiple government agencies for a single point of customer contact. In establishing an integrated contact centre, there is the need to align triage and initial customer interactions from disparate agencies into a single uniform approach. Where possible, customer enquiries and interactions are dealt with within the One-Stop Shop in accordance with schemes set down by the individual agencies. Many common functions (e.g. cash receipting, subscriptions, customer identification management) are amalgamated into single unified OSS functions. A key requirement of the agency schemes for handling customer service requests is that they allow OSS service agents to identify interactions that cannot be dealt with by an OSS service agent to be routed to either a co-located agency specialist or to the back-office of the relevant agency for further specialist handling. Typical OSS customer request handling capabilities fall into four distinct parts:

- Front line service delivery, where an initial customer contact is received, specific requests requirements are ascertained and a decision is made on how to route the request for actual fulfilment. In effect this is a triage service and no actual service delivery occurs instead the focus in on determining how to handle the request
- Service discovery, where a decision is made as to which specific service will be used to fulfil the customer request and the request is routed accordingly for further action. This and subsequent OSS capabilities require a more specialist range of skills than the initial Front line service delivery activities.
- Second line service delivery, where if possible the requested service is delivered or preparations are made to transfer it to an appropriate agency for further attention. These activities typically require the skills of more domain specialised service agents and in some cases, specialist agency service officers will be in-sourced into the OSS to deal with these work activities.

- Agency transfer, which involves the actual despatch of the customer service request to a specific agency for fulfilment. Typically this activity is coordinated by a service specialist in the relevant domain to ensure all required information has been gathered as part of the preparation for handover and that the customer is fully conversant with the handling scenario.

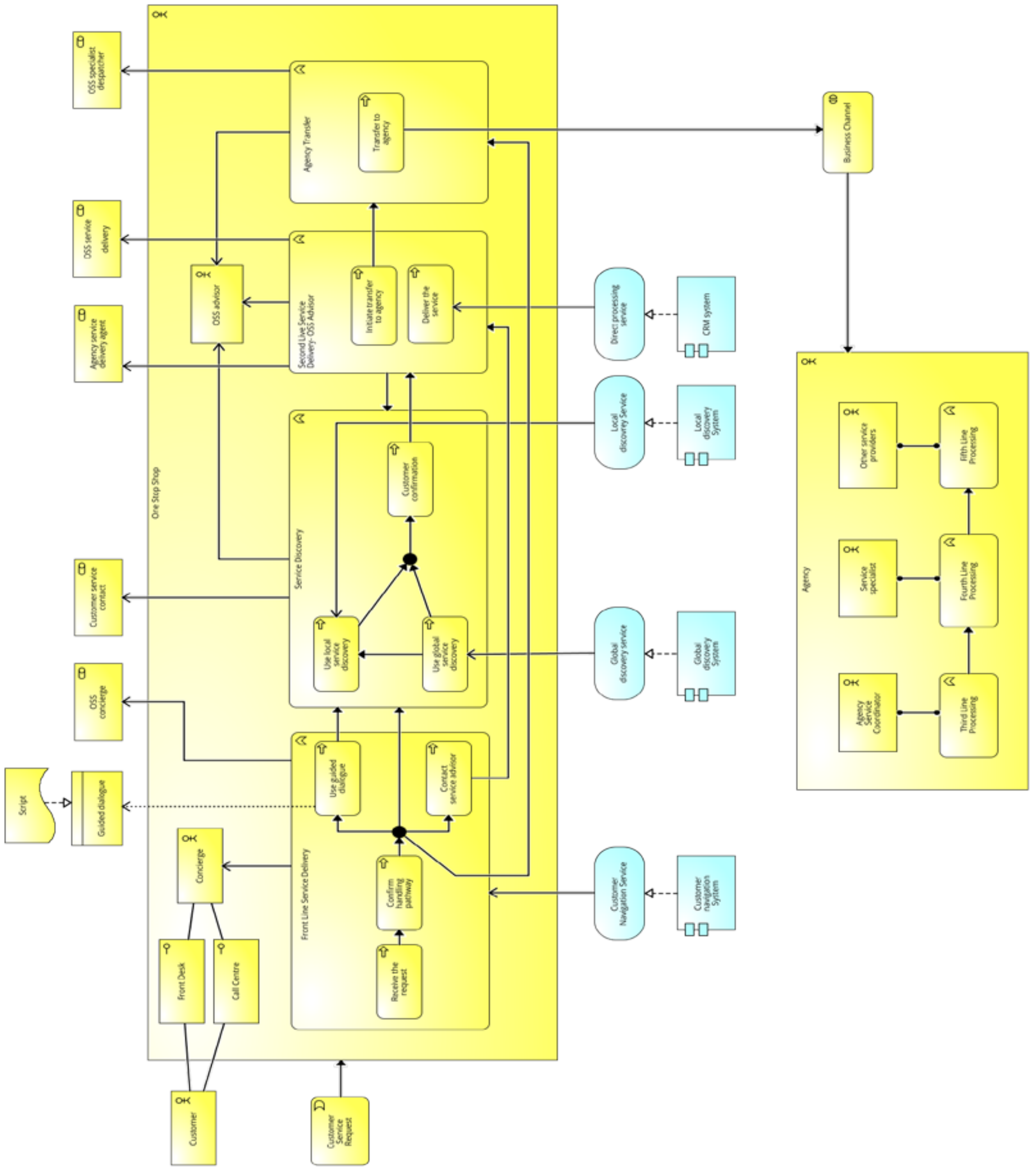

Figure 3: The ArchiMate model of One-Stop Shop

Figure 4 identifies the role constraints, based on the definitions in Table 1, which apply in the context of the One-Stop Shop example. There are five distinct business roles that apply in the context of the One-Stop Shop:

• OSS Concierge – mainly staffed by concierge resources – is responsible for the initial triage and routing of customer service requests to the correct service location. Limited skills and capabilities mean that they cannot fulfill other roles in the OSS hence there are a range of canConflictWith constraints that exist with other roles.

• Customer Service Contact role undertakes the Service Discovery function to determine how to route requests for fulfillment. Some staff members have the skills required for the more senior OSS Specialist Despatcher role.

• OSS Service Delivery Agent role provides second line service delivery and where possible actually delivers service outcomes. It is staffed by permanent OSS team members. This role mirrors the Agency Service Delivery Agent role as it shares the same capability requirements.

• Agency Service Delivery Agent role provides second line service delivery but unlike the OSS Service Delivery Agent role, it is staffed by specialists from specific agencies

• OSS Specialist Despatcher role is comprised of service specialists who handle agency transfers. Its staff require all of the skills possessed by the OSS Service Delivery Agent role. On occasions (e.g. call centre overflow), its members can stand in for members of the OSS Service Delivery Agent role and perform their duties.

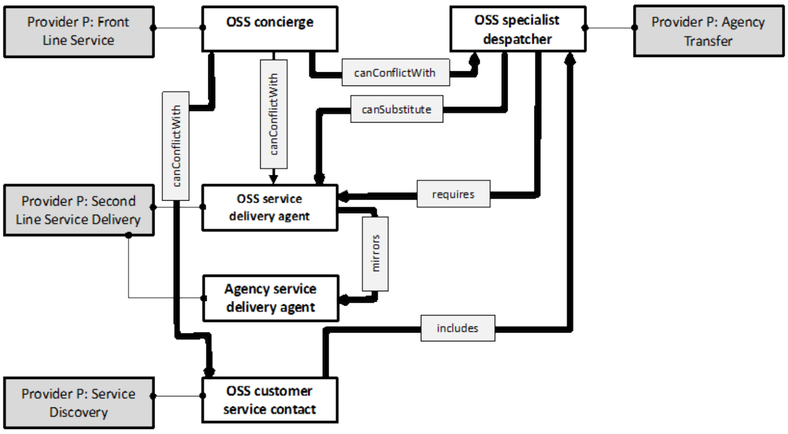

Figure 4: One-Stop Shop: illustrative role-constraints

RELATED WORK

The following section provides an insight into state-of-the-art EA techniques, methodologies, frameworks and their applications. Different EA techniques or frameworks are applicable for different situations. Some such as TOGAF, are focused purely on documentation, and stakeholders (Chen & Lillehagen, 2004). Others such as ArchiMate and RM-ODP are focused on visualisation and modelling of key concepts (Lankhorst, 2009). None of the EA concepts explicitly supports constraints defining the use of artifacts outside of the control of their originating organisations (Kutvonen, Metso, & Ruokolainen, 2005). Some of them such as ArchiMate support services and views that are relevant for business networks. However, it is not clear how internal aspects of EA relate to an external EA supportive of business network planning. Business network planning requires capturing artifacts that are essential for the interaction of business partners in a network environment. Dependency constraints that govern extension and alignment are not explicit. Such constraints have been proposed for extending services at business network level as supported by service languages like USDL (Barros & Oberle, 2012), however these have so far not been exploited by EA methods. Taken together, it is uncertain how EA can support business network planning, as proposed through our EA constructivist synthesis and the requirements and artifact constraints therein.

CONCLUSIONS

In this paper, we have argued that business network planning requires dedicated support through EA, and that current EA methods, while supporting cross-organisational interactions, leave open the modelling of how key organisational artifacts such as resources, services, processes and business objects are reused and extended through external partners. We have established a constructivist synthesis in terms of cognitive contexts (business network situations), requirements defined in view of these contexts, and requirements features (more detailed constraints manifesting the requirements against focal artifacts). Specifically, we have detailed six constraints defining how services and resources, as important artifacts, can be extended or referenced, as warranted by different network situations. At the heart of the paper, we described a case study undertaken for a large, eGovernment network endeavour (a federated One-Stop Shop supporting service delivery across all government agencies). The case study helped illuminate EA extensions through the standard TOGAF/ArchiMate method supporting resource and service reuse at the network level. We illustrated how resource constraints models can be combined with integrated scenario models to indicate how local resources can be substituted, extended etc. at the level of the network, such that models retain their compact form. These developments to date are first expositions, and future work will develop further requirements and extensions covering all artifacts. We will also consider other network situations including contemporary resource models such as liquid workforce and crowdsourcing.

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