



Delivering Service Oriented Architecture; Realising Enterprise Architecture

Whitepaper

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Introduction

Improved interconnectivity is at the forefront of IT strategy for many organisations, both in the commercial and public sectors. The objectives: to provide flexible internal connectivity to streamline processes and improve responsiveness to change; and simpler and cheaper external connectivity to expand opportunities for exchanging goods and services with partners, suppliers and customers.

In addition, many global organisations are looking to converge, consolidate and share common business functions, and the associated information technology, in order to reduce costs and leverage scale. With these strategic objectives in mind, and along with the emergence and continued maturity of Web Services technology, Service Oriented Architecture †(SOA) has returned to the agenda of many IT Strategists.

Enterprise Architecture † (EA) shares many of its strategic drivers for adoption with SOA. Organisations have recognised that by having a greater understanding of the business processes, applications, information and technology that exist across the enterprise, they are able to improve quality as well as identify inefficiencies, cost savings, and opportunities for sharing (see Figure 1). In addition, strategy management and governance processes can be established that use this knowledge to develop and enforce common architecture standards. These ensure that change and improvement initiatives are aligned to all enterprise level business and IT objectives.

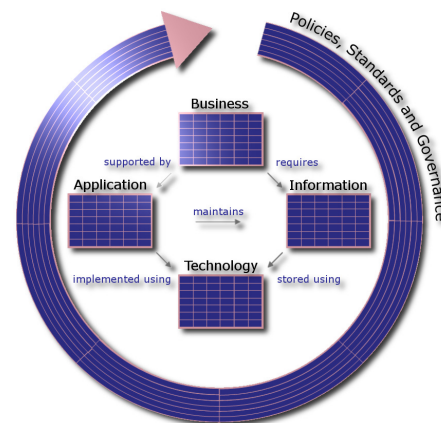


Figure 1. Enterprise Architecture Elements

In this paper we will use a fictional contract logistics company, Packages4U ‡, to explore the key steps in the adoption of SOA; from the initial Business Case through to the introduction of technology and ongoing service management. In doing so, we will see that many of the disciplines associated with EA are in fact pre-requisites for successful adoption of SOA – for example, standards development, dependency management and governance. Furthermore, we will provide examples for how enterprise knowledge can be maintained and re-used in a manner consistent with EA practices (see Figure 2).

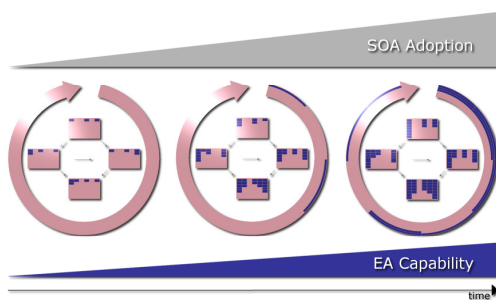


Figure 2. EA Development alongside SOA

† See Wikipedia for a good definition (<http://www.wikipedia.com>)

‡ Although the logistics company Packages4U does not exist, the questions that need to be answered are derived from real-world experience of delivering SOA in large global organisations.

Packages4U: a Contract Logistics Company

Company Background

Packages4U is a global contract logistics company. It has business units spread across the world, each with their own dedicated IT group. A number of years ago, the company recognised that throughout their organisation, inefficiencies and complexity existed that hindered their ability to respond to market needs in a timely manner. In addition, pressure to reduce overall IT spend was intensifying. Opportunities for cost savings needed to be identified without compromising quality or putting the business at risk.

SOA was under consideration as a global strategy for delivering IT solutions that support the business in a more flexible and cost-effective manner. More specifically, SOA was viewed as having the potential to address many of the complexity (e.g. application integration), quality (e.g. master/reference data) and inefficiency (e.g. application diversity) issues associated with Packages4U's current IT landscape.

It had been recognised that the knowledge gained and processes established in support of their SOA strategy could potentially form the foundation for an ongoing Enterprise Architecture capability. Senior IT management were supportive of this concept, provided that the introduction of EA practices did not create too great an overhead on the SOA initiative, in terms of resources and overall costs.

To this end, a basic EA toolset was selected to ensure that the knowledge assets resulting from the SOA initiative were maintainable and shareable across other strategic initiatives. This toolset consisted of a common language for describing the architecture elements in scope (i.e. a basic EA taxonomy) and, to minimise initial investment, an open source UML Tool for maintaining and publishing the EA knowledge gathered.

Defining the Business Case for SOA

In order to gain senior level buy-in and proceed with the definition of an SOA adoption strategy, it was imperative that Packages4U were able to justify their adoption of SOA in both qualitative and quantitative terms.

This involved:

- **Understanding the level of opportunity that existed for consolidating and sharing business processes, application functionality and information inside and beyond the global enterprise**

Packages4U explored their business and IT landscapes and identified a number of key areas where information, functionality and business processes were either being integrated or duplicated.

To support the ancillary objective of EA capability development, the knowledge gained from undertaking this task was captured as current state models using the selected EA toolset. Figure 3 illustrates how the EA taxonomy and UML tool were used to capture the integration and duplication of Stock information across a number of Packages4U's systems – a clear opportunity for consolidation and sharing through the creation of a common Stock Information Service.

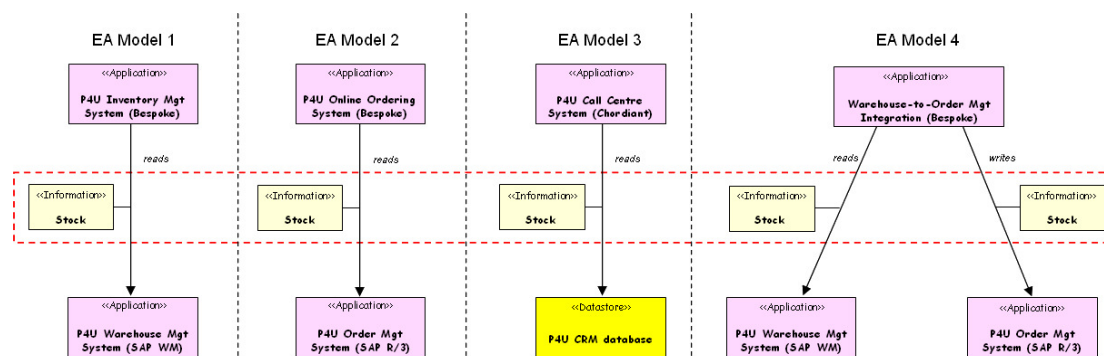


Figure 3. EA Current State Models

- **Identifying new business capabilities that could be enabled through the adoption of SOA**

Packages4U consulted the business and IT communities to identify current and anticipated business opportunities that were being hindered by the organisation's inability to interoperate and integrate people, processes, functions and information.

This task resulted in Packages4U capturing both current and future state EA knowledge. Future state models describing the high-level capabilities, processes, services and products that the business would like to establish; current state models describing the nature of the IT assets (applications, data and technology) that were constraining their delivery.

- **Determining the cost implications for SOA adoption over the next 5 - 7 years**

To identify potential cost savings, Packages4U looked to understand where technology infrastructure and associated operational support could be consolidated or rationalised through SOA adoption. The potential value of new business capabilities, services and products was also taken into consideration. To appreciate the approximate level of investment required, they investigated their current capabilities and industry best-practice. Then, through a high-level gap analysis, they were able to understand the potential costs associated with new or upgraded infrastructure/tools as well as staff retraining.

This value and cost information was added to the EA models that had already been captured.

- **Identifying the technical and organisational risks associated with adopting SOA**

Packages4U needed to identify the potential issues that could impede the successful adoption of SOA and the attainment of the intended benefits. These could range from technical issues such as network bandwidth to organisational issues such as the business/IT engagement model for business solution delivery.

For this task, Packages4U were able to leverage the EA knowledge that had already been captured (in particular for identifying technical risks) and began to identify some of the governance processes, standards and policies that would be needed to mitigate the organisational risks.

In summary, to support the development of a Business Case for SOA, Packages4U needed only to gather sufficient evidence of global sharing opportunities, new capability enablement,

cost justification and manageable risk. An exhaustive knowledge gathering exercise was therefore unnecessary at this stage.

Indeed, to make the case for SOA adoption, Packages4U only required a high-level understanding of their key business process areas as well as the applications, information and technology that supported them (see Figure 3). Nonetheless, the EA models that were created provided a common language for articulating this knowledge, such that it could be leveraged and extended as the SOA Strategy progressed.

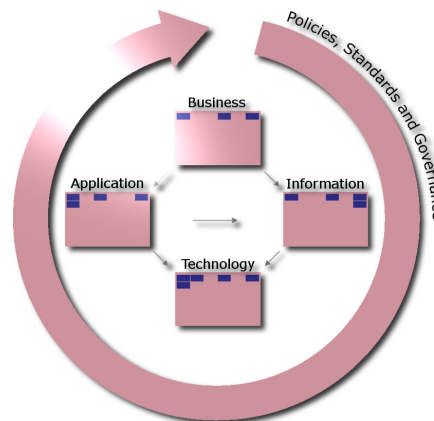


Figure 4. EA Capability resulting from SOA Business Case

Defining the SOA Adoption Strategy

Having been convinced by the business case, Packages4U's senior IT management agreed to go forward with SOA adoption. The next step, therefore, was to define a strategy for evolving the enterprise to a state where the business was capable of taking full advantage of SOA and IT were capable of delivering and supporting it.

This involved:

- **Defining a Service Evolution Plan to identify and prioritise the classes of candidate services to be delivered over time.**

It was imperative that Packages4U selected and prioritised the Shared Services to be delivered in such a way that early traction was gained and buy-in was maintained for SOA across the organisation. The approach taken was to define a Service classification scheme based upon a number of key characteristics, including:

- Service Type (i.e. Information, Function, Process)
- Domain (e.g. Order Management, Inventory Management, Technical)
- Business Value (High/Medium/Low)
- Business Impact of Failure (High/Medium/Low)
- Technical Complexity (High/Medium/Low)
- Security Needs (High/Medium/Low)
- Usage Level (High/Medium/Low)
- Consumer Scope (Internal Only/External Only/Internal and External)

A Service Evolution Plan was then defined in terms of the characteristics laid out in the classification scheme. For example, the earliest Services to be delivered according to Packages4U's Service Evolution Plan were internal Information Services with medium to high business value and low to medium technical complexity. Taking this approach allowed Packages4U to plan the delivery of Shared Services over the long term without having to identify all the services in detail upfront.

Packages4U's classification scheme for Services was incorporated into their EA taxonomy in readiness for maintaining this additional information for architecture management purposes.

- **Defining a Technology Vision and Evolution Plan that described how Packages4U's IT infrastructure would evolve over time in support of the Service Evolution Plan.**

Given the Service Evolution Plan, Packages4U were able to define a future state Technology Vision and Guiding Principles in terms of the technology capabilities required to support SOA in the long term. They then undertook a more detailed current state analysis and gap analysis to determine where they could leverage existing infrastructure and where they needed to either upgrade or obtain new technology.

Packages4U's Technology Vision was captured using their EA toolkit so that it could be maintained and referenced as their IT infrastructure evolved to meet it. The current state analysis and gap analysis tasks were heavily supported by the EA knowledge captured during the SOA Business Case activity and where knowledge gaps existed, the existing models were augmented with new information. For example, Figure 5 illustrates how knowledge relating to the technology supporting applications was captured using the EA Taxonomy and UML Modelling Tool of the Packages4U EA Toolkit. This information was used to gain an appreciation of the scope of technologies that would potentially need to be exposed as Web Services (i.e. Web Service Technology Adapter requirements).

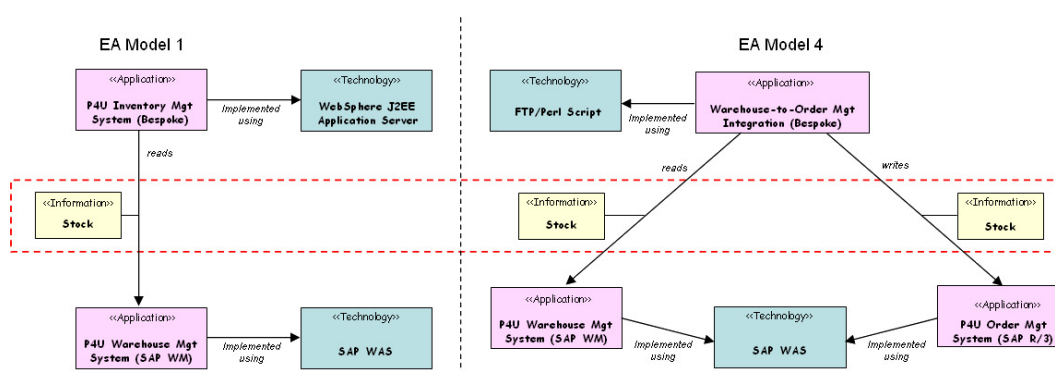


Figure 5. Current State EA – Technology View

There then followed a capability-driven technology selection process where prospective technology vendors were given the opportunity to explain their vision for SOA and demonstrate how their products would provide the capabilities required by Packages4U in the short, medium and long term. The final selections were made and verified through the development Proof of Concepts and then, with support from their selected product vendors, Packages4U were able to map out a 5 year Technology Evolution Plan, captured as a series of technology architecture models using their EA toolkit.

- **Defining an Organisational Vision and Evolution Plan that described how Packages4U's business and IT organisations would need to evolve together in support of the Service and Technology Evolution plans.**

Given the Service and Technology Evolution Plan, Packages4U then proceeded to develop a future state Vision and Guiding Principles for how their business and IT working practices would need to evolve to take full advantage of, and support SOA. These would consider factors such as organisational structure and culture, skills, project delivery practices, strategy management and monitoring, the business/IT engagement model, project costing and funding.

Again, a current state and gap analysis was undertaken to allow an Organisational Evolution Plan to be developed in line with the Service and Technology Evolution Plans.

It was at this time that Packages4U were able to begin identifying some of the EA governance models and strategy management processes that would be required to support SOA in the short, medium and long term.

- **Defining a Global Communication Plan that described how Packages4U would maintain buy-in from senior management as well as the broader business and IT communities.**

It was imperative that Packages4U defined the content, mechanisms and timing for communicating with the key stakeholders who would be impacted by the adoption of SOA. To this end, they identified stakeholders for the development, usage and management of Shared Services and created a communication plan.

In summary, to support the definition of an SOA Adoption Strategy, Packages4U were able to leverage and build on the EA knowledge gained from the development of the SOA Business Case (Figure 6). They were also able to begin outlining the governance models and working practices that would be needed in order to manage and maintain the SOA, as business requirements and industry best-practice for technology evolved.

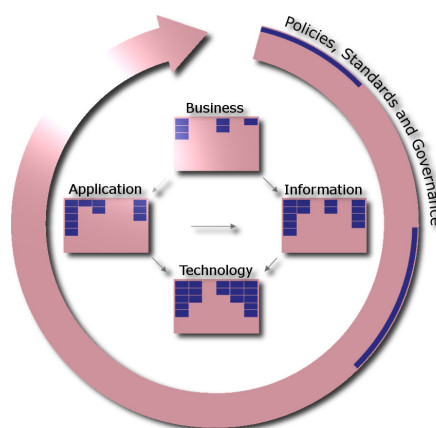


Figure 6. EA Capability resulting from SOA Adoption Strategy

SOA Introduction

With the SOA Adoption Strategy approved and signed-off, Packages4U were ready to begin implementing their SOA Strategy in line with their Service, Technology and Organisational Evolution Plans. At the earliest stage, this meant migrating from their existing organisational and IT capabilities to the IT infrastructure and working practices defined as the first level of evolution on their SOA Adoption Strategy.

This involved:

- **Rolling out the Technology Capabilities (i.e. tools and infrastructure) defined at the first level of the Technology Evolution Plan**

In order to deliver, support and manage the Shared Services identified at the first level of the Service Evolution Plan, Packages4U needed to upgrade existing IT infrastructure as well as introduce new technology into their IT landscape. The Technology Evolution Plan also outlined how, over time, existing technology would be decommissioned once the new capabilities were in place and established.

This task was driven by Technical Architecture models from the Technology Evolution Plan, corresponding to the first level of SOA adoption in the Service Evolution Plan. More specifically, these models presented how the technology components selected as part of the SOA Adoption Strategy should be structured and deployed – in this case, new technology introduced included Web Service development tools and adapter frameworks,

a global service directory and a global service management platform for monitoring, configuration management/version control as well as managing and enforcing the policies to be applied to Shared Services at runtime (e.g. security, failover, quality of service). These components were deemed by Packages4U as being the minimum required to deliver, support and manage the Shared Services identified at the first level of the Service Evolution Plan. The global directory and service management platform, in particular, were seen as critical if SOA adoption was to be well-controlled and properly managed from the start.

- **Defining and rolling out SOA policies and standards to guide the development and management of Shared Services at the first level of the Service Evolution Plan**

Given the technologies selected to support the first level of SOA adoption within Packages4U, it was then necessary to define and publish SOA policies and standards such that consistency and quality was maintained for the development and operation of all Shared Services. These standards and policies included:

- *Technology Usage Policies*, technology architecture patterns or reference models that ensured consistency in identifying the technology to be used to develop given Shared Service types (e.g. Java for Functional Services, BPEL4WS for Process Services).
- *Security Policies*, outlining how the Enterprise Roles used by the Global Service Management Platform were to be maintained and mapped to the available security capabilities (e.g. encryption, access control)
- *Service Interface Standards*, outlining the rules that maintain consistency for how the Web Service Definition Language (WSDL) is used to describe Shared Services and the operations that they provide. These rules would also outline how standard, common data schemas were to be used and maintained (e.g. domain-based shared schemas for order management, marketing, finance).
- *Management Policies*, describing a consistent approach to identifying and supporting the management needs of Shared Services and their consumers (e.g. configuration management, version control, reporting and monitoring).
- *Service Implementation Standards*, providing software design patterns and guidelines for the implementation of Shared Services, given the type of service to be developed and the technology to be used.

These policies and standards were captured using office tools as well as the Packages4U EA toolkit. However, the policies and standards that were produced as flat documents were imported into the UML Modelling tool as links and then mapped to the appropriate knowledge assets.

- **Defining and rolling out the organisational changes required to deliver, support and manage the early Shared Services in accordance with the SOA policies and standards**

Packages4U also needed to ensure that both the business and IT communities were aligned and in position to begin identifying, developing, using and supporting the early Shared Services in a consistent manner. More specifically, in addition to the execution of the Global Communication Plan, this involved putting in place roles and responsibilities as well as delivery, governance and operational processes in support of:

- *Service Delivery*, the development processes and overarching governance procedures associated with proposing, defining, implementing, testing, deploying and consuming Shared Services.

- *Service Provisioning*, the procedures to be followed when setting up or modifying the management policies associated with Service Consumers (e.g. security, QoS).
- *Service Change Management*, the procedures for determining the impact of changes to Shared Services, maintaining version control and approving proposed changes.
- *Service Monitoring and Reporting*, the operational procedures for managing alerts, problem management and escalation.
- *Service Capacity Management*, the procedures for managing the introduction or upgrade of technology infrastructure to support the capacity requirements of Packages4U's SOA.
- *SOA Strategy Management*, the processes for managing the SOA Adoption Strategy; maintaining its alignment with the strategic objectives of the business as well as industry best-practice (e.g. emerging technology standards).

These roles and responsibilities, processes and procedures were being put in place to maintain and enforce the SOA standards and policies for the first level of SOA adoption. In some areas of the organisation, this required staff re-organisation, re-training and a period of mentoring (e.g. development teams, IT operations), while in others, raising awareness via the Global Communication Plan was sufficient to facilitate buy-in and adoption (e.g. project managers, business teams). In either case, the EA toolkit remained the central point from which SOA standards and policies were maintained and published to stakeholders.

o **Developing and deploying a pilot Shared Service.**

In order to 'exercise' the new IT infrastructure and working practices as well as provide an early demonstration of the potential value of SOA to key stakeholders, Packages4U chose to deliver a Pilot Shared Service. In accordance with the defined SOA standards and policies, as well as the roles, responsibilities and processes that had been put in place, the steps undertaken included:

- Selecting a candidate Shared Service, given the characteristics identified for the first level of adoption (e.g. Information service type, low complexity).
- Analysing the potential consumers of the selected service to derive the nature of the operations to be supported.
- Defining and validating the WSDL interface for the Pilot Shared Service,
- Defining and gaining approval for the technical architecture supporting the Pilot Shared Service.
- Implementing and testing the Pilot Shared Service based on the software design patterns and guidelines from the SOA standards and policies,
- Publishing the Pilot Shared Service interface to the Global Service Directory, and deploying the Service Implementation into production, ready for provisioning to Service Consumers.
- Identifying existing integration solutions that could be migrated to consume the Pilot Shared Service,
- Defining the management policies to be associated with the migrated integration solutions.
- Modifying the migrated integration solutions to consume the Pilot Shared Service and testing them in a QA environment.
- Deploying the migrated integration solutions into production and provisioning them as consumers of the Pilot Shared Service in accordance with the defined management policies.
- Monitoring the reliability and performance of the Pilot Shared Service as well as any impact on underlying systems.

- Providing positive and negative feedback on the standards, policies and procedures in place.

Throughout these activities, the EA toolkit was key to the successful delivery and execution of the Pilot Shared Service. For example, the knowledge contained in the EA models was queried and used to identify the Stock Information Service as an ideal candidate for the Packages4U SOA pilot. Once the pilot was in place, the models were then updated to reflect the changes made (see Figure 7).

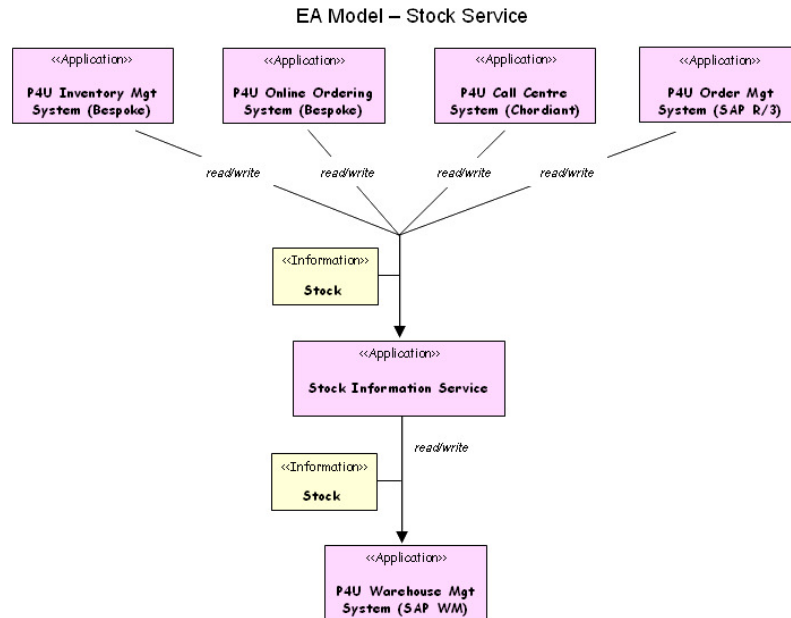


Figure 7. Updated EA Model Reflecting New Stock Service

By developing standards and making the technology and organisational changes required to support the early stages of their SOA Adoption Strategy, Packages4U had introduced a number of common, enterprise-level practices that could be considered to be facilitating EA. In addition, EA knowledge had been augmented with the detail garnered during the development of the Pilot Shared Service and its associated Service Consumers (see Figure 8).

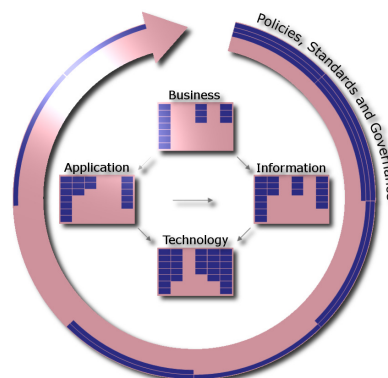


Figure 8. EA Capability resulting from SOA Introduction

Summary

It is no coincidence that SOA and EA share common drivers for adoption. However, if the benefits associated with adopting SOA are to be achieved in a cost efficient and manageable way, organisations must view SOA as a strategic, enterprise-wide, joint initiative between business and IT. This should not imply that SOA should be delivered as a single, large project. Indeed, with any organisation of scale, SOA should evolve incrementally in a controlled manner. This is where EA can play its part; providing knowledge management, control and structure in support of a measured approach to SOA adoption.

From the other perspective, SOA presents CTOs and senior architects with an ideal opportunity to develop a significant EA capability and demonstrate its value in support of an initiative with tangible and measurable benefits. If buy-in can be gained through the introduction of SOA, the organisational impedances (e.g. culture, skills) that often hamper EA initiatives, when introduced in isolation, may be largely overcome.