Winter 12-2-2011

Driving The Business Service-Oriented Architecture Enabled Initiative

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ABSTRACT

Service-oriented architecture (SOA) continues to gain interest and deliver its business value as so many organisations are force to integrate increasingly diverse legacy systems and complex application environments. Organisations are moving towards implementing SOA initiative to become business SOA-enabled for reducing complexity and increasing business agility. Driving the initiative of SOA into business requires a set of requirements in order to successfully implement SOA. These requirements are four fundamentals of SOA initiative with associated seven elements of SOA which have been discovered via thoroughly literature analysis. A model therefore is proposed for businesses to understand how to implement and run SOA to actually achieving benefits from their SOA initiative.

Keywords: Service-Oriented Architecture, SOA, SOA Initiatives.

INTRODUCTION

Most organisations today have enabled their business processes with information technology and thus they have viewed service-oriented architecture (SOA) as part of the technology where business processes are implemented as services [43]. However, it is more than this. It is a business philosophy and approach in organising the business and its processes because SOA needs vary from one organisation to another [8][45]. Thus, the importance of articulating this business philosophy is to enable businesses to operate and collaborate entirely in a new business concept. It makes it easier for business people to understand and manage even where there are changes in business conditions without having to rebuild the system [35].

As service-oriented architecture becomes prominent within the information technology (IT) marketplace, many organisations are quickly becoming SOA-enabled by having initiatives to implement SOA [44]. Implementing SOA initiative requires a comprehensive initiative plan to organise the business and its processes effectively [34]. SOA initiative is where organisations implementing SOA successfully through a step-by-step process with a reference implementation that demonstrates the recommended use of standards and best practices [46]. The initiative plan is essential for an organisation that is willing to move forward and succeed in business. Thus, an organisation should employ or create a suitable workable plan for transforming business processes to SOA that quickly respond to business change.

Many major IT vendors have embraced SOA due to the enormous potential of SOA. Indeed, two recent Forrester research reports on preferred SOA vendors by customers evaluated that the top SOA vendors are providers such as IBM, BEA Systems, Software AG, SAP, Oracle, TIBCO and Accenture [26][56]. In this review of the literature, the SOA solutions from these vendors were analysed comprehensively together with relevant literatures to obtain common elements and fundamentals that can employ to implement SOA initiatives into an organisation.

This paper is structured as follows: the first part describes the background of SOA initiative based on relevant literature. The second part is the main focal point in presenting the model for SOA initiatives. Finally the paper draws a conclusion.

IMPORTANCE OF SOA

With the evolution of information technology, communication through the Internet has been used widely to establish business relationships by having business-to-consumer interactions and business-to-business collaborations [1]. The message of communication as regards information is emphasised as an asset to an organisation [42] which will grow and become rich together with ideas and knowledge when collaborating and interacting between people. This important asset should be fully-utilised and maximise its potential value to drive organisations to implement SOA [8]. In fact, consulting companies disclose that the implementation of SOA initiatives to industry have been constantly adopted [18]. This is supported by a recent Gartner report; nearly 60% of the software market for SOA will grow by 2011, which shows an impressive growth in the implementation of SOA

initiative in organisations [12].

Organisations' views on information are changing, when realising the importance of SOA. About 74% of recently surveyed organisations have plans to deploy or are already deploying SOA [17]. Even organisations investing extensively into SOA, measuring business value and return on investment (ROI) are believed to seek outcomes which are still possibilities not probabilities [7]. SOA will be the key to business success and innovation through its benefits of flexibility, speed and simplicity [39]. Utilising SOA will achieve business goals and objectives successfully without changing the underlying applications but leveraging services with a flexible infrastructure [41] and thus, controlling the integration costs [43]. SOA facilitates business users in their working environment within or across organisational boundaries by integrating other applications to develop and support dynamic, complex, and collaborative business processes [28][37].

Understanding the value and importance of SOA as well as its essence will enable organisations to be more flexible and agile in business processes [32]. This flexibility and agility will allow IT to ease integration and react to changes in technologies and business requirements [33], which enhances business effectiveness and efficiency. Therefore, SOA offers important keys to business growth and success by providing solutions for both business and IT environment.

SOA BUSINESS VALUE

Many organisations perceive their SOA initiatives will increase their business value. Recent surveys from Forrester research show organisations initiatives in implementing SOA as a business enabler are rapidly increase [25]. This means that organisations everywhere are turning to SOA to bridge and align IT initiatives with business goals. Furthermore, many chief information officers (CIO) lead to change the existing business infrastructure with modern and flexible technology [21]. This is supported by recent Gartner research where organisations SOA initiative able to grow revenue and achieve positive returns which usually takes 10 months [48].

Consequently, there are three main concepts in terms of compatibility, complexity, and discrepancy (see Figure 1) for building on SOA for greater and positive business value and thus, implement SOA initiatives [6]. Compatibility means legacy applications can be integrated and compatible with SOA [4]. Complexity means the ease of use of SOA across organisation which associated with governance [58], technology and organisational change [59]. Discrepancy means organisations achieve flexibility, reliability and upgradability from SOA [30] lead to perceived needs on top of the benefits obtained from existing technology. But, flexibility is the most important driver for SOA [25].

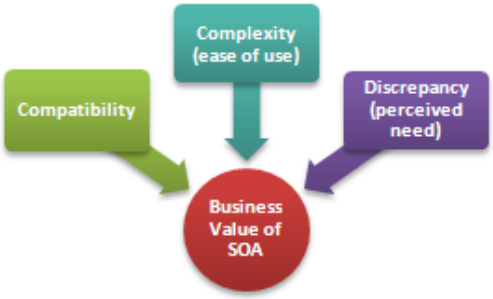

Figure 1: Main concepts – SOA business value [6]

With this concept in place, organisations can extend their business value in a way that SOA extends the life of legacy systems by fitting into current capabilities, goals and priorities. Furthermore, SOA provides benefits to businesses through its implementation that is capable to support current infrastructure as well as applications and to deliver more effectively in response to changing market conditions [31][57]. Thus, with available resources, implementing SOA initiative that helps organisations to be more agile and flexible in-line with business objectives and processes in the face of changing market demands is the ultimate business value.

METHODOLOGY

The research methodology for this study consists of five steps (see Figure 2).

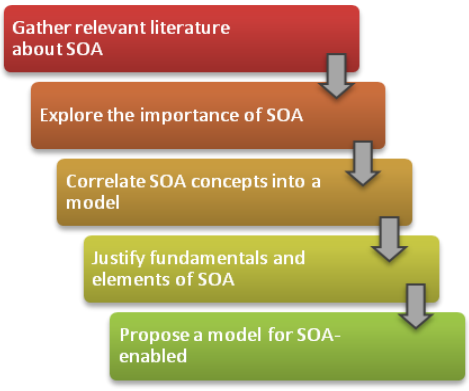

Figure 2: Research methodology

First, the background information about service-oriented architecture and relevant information are gathered by searching the existing literature such as journals and academic conference proceedings. In addition, industrial papers like white papers from SOA vendors are searched for review. Second, we explored the importance of SOA to business by summarizing

the information that was gathered. Third, the SOA concepts were correlated into a model. Fourth, the fundamentals and common elements were justified as key important in having SOA initiative. Finally, a model for business SOA-enabled initiative is proposed based on the study.

PROPOSED MODEL

After analysing the reviewed literature, four fundamentals of SOA have been identified: maturity, technology, governance and change management. In addition, the elements of building SOA have been discovered that consists of seven elements: services, business requirements, organisational, roles and responsibilities, technology infrastructure, standard requirements and tools. Figure 3 shows the proposed business SOA-enabled initiative. If a business employs this model, it may improve the initiative of SOA implementation, which in turn will lead to become business SOA-enabled organisation.

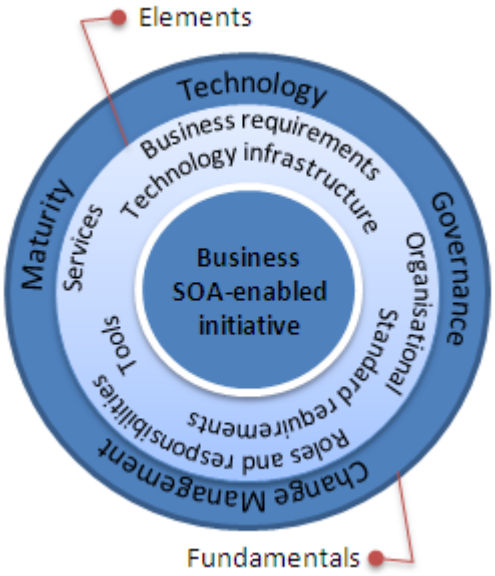

Figure 3: Business SOA-enabled initiative model

Following subsections, the fundamentals and elements of SOA initiative are discussed in detail.

Fundamentals of SOA Initiatives

There are four fundamentals for SOA initiatives in order to identify and support the business strategy requirements towards implementing successful SOA [5]. The fundamentals are maturity, technologies, governance and change management which is described next.

Maturity

Current maturity of an organisation can be evaluated by using maturity models within the IT field. A recent study determined two distinguishing maturity models namely 'process maturity model' and 'stage maturity model' [55]. The most well known process maturity model is the Capability Maturity Model Integration (CMMI) developed by the Software Engineering Institute at Carnegie Mellon University and which focuses at controlling and improving the quality of software development processes [14] whereas a stage maturity model is used to benchmark IT adoption within an organisation [55]. Thus, SOA maturity model is one of the examples for stage maturity model where it used to measure the current state of SOA adoption of an organisation [29].

There are many SOA maturity models available from large IT vendors such as IBM, SAP and Oracle. Thus, with these maturity models, SOA analysis and development is approached in somewhat different ways according to the level of maturity such as a solution for organisations' initiative that has supportive roadmaps, guidelines and framework to coordinate the different paths to SOA internally or across organisations [49]. This section will explain briefly the SOA maturity model [2] that is widely adopted in the literature as shown in Figure 4.

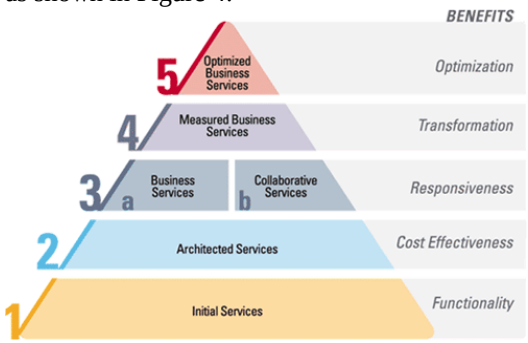

Figure 4: SOA maturity model [2]

This SOA maturity model has five levels of maturity: initial services, architected services, business and collaborative services, measured business services and optimised business services, along with their benefits. The lower levels of maturity; level 1 and 2, are the starting point where it is a learning process phase which benefits from functionality to cost effectiveness of an organisation. In upper levels of maturity; level 3, 4 and 5, an organisation become optimised and matured by providing clear business responsiveness, transforming services to real-time business and optimising services to react and respond automatically.

Technology

Various technologies and concepts related to SOA give agility to organisations and allow flexibility in business processes depending on the business and system requirements. In order to achieve these benefits, organisations working on specification related to web services [3]. This widely used technology is come from web

application technology [24] to support the realisation of organisations' SOA vision. It is based on broadly adopted standards (refer to Table 1) such as XML language [23], WSDL, SOAP and UDDI [33][50]. In addition, the technology of web services together with enterprise service bus (ESB) and service registry makes a SOA real [9][24].

Table 1: Standards for SOA [33]

Standards	Abbreviation	Description
XML	eXtensible Markup Language	Fundamental to web services that provides a way to describe information.
WSDL	Web Services Description Language	Used to describe WS interfaces, which define operations and then binds them to one or more protocols.
SOAP	Simple Object Access Protocol	Defines an envelope and rules for representing information sent in that envelope. SOAP messages are commonly conveyed using HTTP.
UDDI	Universal Description Discovery and Integration	Stores registrations describing WSs and provides unique names for elements in the registration.

Other possible implementation technologies include Object Management Group CORBA, Java RMI, .NET Remoting, email, Message-Oriented Middleware (MOM), TCP/IP, DCE, JINI/JS, OSGi, or MQSERIES [5][51]. In addition, SOA should support several standardisations bodies with a great involvement of industry, such as World Wide Web Consortium (W3C), Organisation for the Advancement of Structured Information Standards (OASIS) or Web services Interoperability (WS-I). An industry effort by IBM, SAP and Oracle-BEA or alternatively, an open source by JBoss, RedHat where they are also SOA vendors are influencing in the SOA technology which is likely incorporate support for SOA development into their products [22].

Consequently, implementing SOA initiatives lead to the development of more set of technologies and the challenges of building SOA especially related with interoperability, integration complexities and conveying to industry standards, influence today's approach to SOA development. Enabling these technologies allow SOA to operate reliably and securely in support of business objectives and enable to leverage existing IT infrastructure as well as legacy systems to support SOA goals [34].

Governance

Governance is simply about decision and accountability that involves the processes and policies of both business and information technology [47][52]. As organisations are dependable on IT infrastructure, IT governance is needed for consistent management and coordination [40]. Thus, IT governance and service-oriented architecture governance are interrelated. In an SOA, governance has become imperative taking control of the stability of services to retain its reliability within an acceptable service level [29].

A generic SOA governance model, named SOA Governance Control Cycle (SGCC) that has constructed based on the comparison of a number of existing SOA governance models [40] is explained further in brief. This generalised SOA governance model is a straightforward iterative cycle that consists of four phases; planning, design, realisation and operation as illustrated in Figure 5. It is simply to realise the benefits of SOA by managing and assisting SOA.

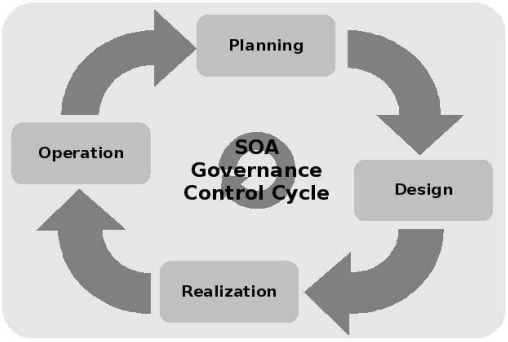

Figure 5: SOA Governance Control Cycle [40]

These phases are in sequence that involves governance activities and processes. The first phase is when the initial governance framework is planned where all SOA requirements, processes and activities are defined as well as roles and responsibilities. Followed by the second phase where SOA policies and metrics are designed for implementing successful SOA based on business and technical requirements. Next, the governance process begins in the third phase by realising all processes and activities defined in the previous phase as well as enforcing policies and metrics. In the last phase, SOA governance processes are evaluated and analysed for their effectiveness. The new cycle is then initiated when addressing

new changes and challenges.

Change Management

Every organisation is aware of the technological change as it often implies risks and how it may impact their businesses [5]. Change is necessary for organisation to minimise those risks of unforeseen challenges and stay competitive in a challenging business environment. Managing the change is not easy but there are ways to deal and make the change easier and to provide an efficient management. One way is to have the SOA initiative for people and for organisation to gain business agility and IT flexibility that SOA offer which is very compelling as it addresses the changing business requirements and marketplace [16][54].

While changes are inevitable that affects the way of doing business, it is an important task related to change management procedures to ensure SOA reflects the updated business processes and fulfills its promise of agility and flexibility. Thus, management tasks and capabilities are needed to accommodate these changes by defining policies; establishing new guidelines and practices; creating implementation plan; restructuring roles and responsibilities; and monitoring operations [5][16]. More importantly for change management however, is to have SOA governance steering committee that comprises of business and IT personnel, who articulates the business strategy, goal, and vision from the beginning of SOA initiative process [38].

Elements of SOA

SOA bridges two worlds; business and IT. It is really important that IT infrastructure can change in pace with changes in the business environment [36]. This can leverage business agility and flexibility. The SOA model comprises a number of elements needed to ease the capacity of SOA services to change to meet new business requirements. These elements are described in the following subsections.

Services

The most common services in SOA are web services [53]. It is a set of services that are highly interoperable, representing business processes to address business needs at minimum cost and with minimum delay [11]. These web services can provide access on various platforms and can be reused more easily across multiple applications. Normally, web services are configured and composed to meet business requirements set by business analysts with business users [8].

Business requirements

In SOA, business requirements are necessary in order to develop services which are able to respond to business change [19]. These requirements identify the needs of business in order to help improve business processes and optimise the use of IT. It can be divided into two approaches – reactive and proactive [34]. The reactive approach enables organisations to identify problems that cannot be resolved immediately whereas a proactive approach helps organisations to predict change and thus minimise the risks of unforeseen challenges.

Organisational

Implementing SOA initiative with a focus on the organisational factors becomes increasingly critical [27]. SOA requires organisational flexibility to its business environment with positive attitude to change and trust in business services across the organisation and support for corporate legal aspects and policies in order to maintain alignment with business priorities and practices [15].

Roles and responsibilities

An individual or a group involved directly in implementing SOA initiatives are those who can lead or drive successful SOA rollouts [8]. The roles include – but not limited to – CIO, chief architect, line-of-business executives, senior architects and IT managers that can be either business oriented or technical (but having an understanding of both is better).

Technology infrastructure

Various hardware – including servers and network devices; software including applications and middleware – need to be fully defined to suit the business needs of an organisation by determining the service volumes, performance and capacity of hardware and network [10]. The technology can be purchased from IT vendors such as IBM, SAP and Oracle or alternatively, an open source by JBoss, RedHat.

Standard requirements

These requirements are also as important as business requirements to ensure that technologies support organisation operations. Thus, having a list of standards that can be broadly adopted such as XML, SOAP, WSDL, UDDI and HTTP is needed to build interoperable web services [50]. The common standards are SOAP 1.1, WSDL 1.1, WS-I Basic Profile 1.0 or 1.1, UDDI 3.0.2, WS-Security 1.0 or 1.1, WS-BPEL 2.0, BPMN, WSRP 1.0, XML Schema 1.0, XSLT 1.0, XPath 1.0, XQuery 1.0, XML Signature and XML Encryption.

Tools

SOA tools are employed in implementing SOA

initiatives into an organisation which are introduced by most IT vendors such as IBM, SAP and Oracle. The review identified four common elements – maturity model, governance, security and quality. A maturity model is used to evaluate the current SOA maturity of an organisation [29]. Governance is simply concerned with decision-making and accountability that involves the processes and policies of both business and IT [47][52]. Security is necessary as SOA is being practiced within the openness of web services [20]. And applying quality on web services can provide better quality of service (QoS) [13].

CONCLUSION

Service-oriented architecture is vital focus for any organisations to adopt by having SOA initiative to improve their business. In this paper, we have discussed the four fundamentals of SOA initiative: maturity, technology, governance and change management. Under these four fundamentals, important elements that should be considered when implementing SOA are services, business requirements, organisational, roles and responsibilities, technology infrastructure, standard requirements and tools.

Based on both SOA fundamentals and elements, we have proposed a model for implementing successful SOA initiative in an organisation with high agility and flexibility. The model can be used as reference guideline when considering implement SOA initiative. Further work is required in which we intend to study issues and challenges of SOA initiative by conducting case studies and will result in proposing a comprehensive framework to implement SOA initiative better. In conclusion, the SOA fundamentals and elements are playing an increasingly important role in implementing business SOA-enabled initiative because SOA offer business value and are therefore central in determining the successful SOA implementation.

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