Serviam Literature Survey

Part II

Business Value

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1 Introduction

"*Web services isn't about technology; it's about successful business strategy.*" (Dunn, 2003, p.17)

"*Web services has nothing to do with technology and everything to do with management.*" (Murphy and Stoyanova, 2003)

There has certainly been a hype around web services (WS) recently. Virtually every major organisation of all types have taken up positions regarding WS (Azzara, 2002). WS are important because they represent a fundamental shift in the way applications are developed and deployed (Wong, 2002). Still, the true benefits from using WS are still to come. However, expectations are great. For example, a study by the Hurwitz Group reported that 54% of their respondents expected a high degree of business value to come out of WS usage (Azzara, 2002). So far, much of the written material deals with the technological issues and standards included in the WS stack. This report will take a slightly different focus, and direct the attention towards the business value of web services, as illustrated by the two initial quotations. Web services are more than simply a technology issue. The business benefits are even greater than the technological benefits.

1.1 The hype

During the first hype period, innovators and pragmatics were leading the WS work, innovators primarily during the first rise, and pragmatics at the top and the decrease thereafter. This is roughly where we are today (see figure 1).

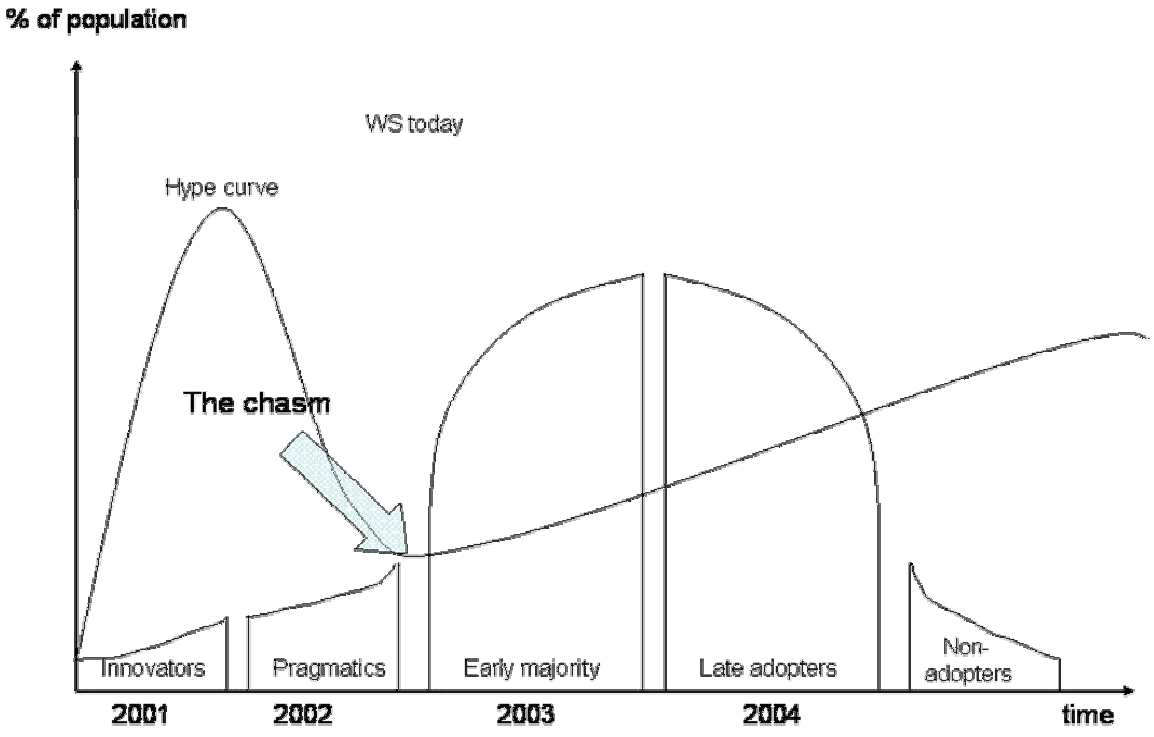

Figure 1: WS technology adoption cycle (from Syntegra, 2002)

It should be noted that the figure is a year old, and may therefore not be 100% up-to-date. Still, it provides some guidance on the current situation for web services. In the nearest future, a slow but steady rise in WS popularity and use is expected, starting with the early majority bunch. They will be followed by late adopters. Among the pioneers (innovators) for web services were banking and financial services sectors (Murphy and Stoyanova, 2003). Examples of early adopters are the travel, retail and communication sectors, while examples of those still lagging behind are health care, utilities, government and manufacturing (Murphy and Stoyanova, 2003; Azzara, 2002). The mix of WS uses between industries shows that variability exists (Azzara, 2002). The first use of web services were, and are, focused on internal integration (Murphy and Stoyanova, 2003; Azzara, 2003). This is where most organisations find the reasons to initiate WS projects. According to Azzara (2002), the combination of internal and external integration accounts for over 70% of the initial WS activities.

Much is written about the technology, and in particular about the included standards, but less has been written on the business perspectives on WS. This report summarises some findings from commercial and academic sources on the potential business value of WS. Many have feared that the hype around WS is actually over-hyped, but according to Azzara (2002), the market believes is the concept. Expectations *are* high.

Before describing the identified groups of WS business benefits, or values, we will set the scene by characterising the markets where WS has the possibility of making its greatest impact, using a paper from Syntegra (2002) as the main source. The first characteristic is that these markets have an *increasing standardisation of business messages and processes*. Such standardisation occurs mainly in the Business-to-Business (B2B) arena, where inter-organisational communication is intense. Secondly, there is a *strong need for competitive differentiation*. This may seem to contradict the standardisation trends, since one common fear concerning standardisation is that it will decrease differentiation between companies. However, this is not necessarily the case. Standards can enable communication and mutual understanding, which can be the basis for creating competitive advantages. Thirdly, financial aspects are highlighted in a *need to grow and/or maintain business with a tight cost focus*. Higher speed means less resources spent, or in other words: time is money. The less effort needed to evolve businesses today, the greater the chance of grabbing a larger portion of the market. Fourth, the markets have an *increased specialisation across multiple geographies*. Most companies want to streamline their ways of working and focus only on differentiating and productive activities. Outsourcing has been one approach that does away with "extra baggage" and allows staff to focus on core competencies. Fifth, markets have *high levels of merger and acquisition (M&A) activities, leading to multiple data and process silos*. By acquiring other companies and integrating these with ones own, there is a rising need to integrate a multitude of separate information or data sources. Finally, markets where WS are likely to have an impact are characterised by *high value in information and a need to rapidly exploit it*. This characteristic combines two traits: the availability of information to organisations, and the possibilities to make use of this information rapidly and in a strategic beneficial way.

In summary, WS will most likely have great impact on markets that are rapidly changing and competitive, where the ability to communicate and the availability of information is essential, and where time is a determining factor. A dynamic business environment forces organisations to constantly evolve and adapt, all depending on the current needs of customers, and pressures from other players on the market.

1.2 WS adoption

Having described the environment in which organisations work, we will now turn our focus towards WS adoption. There are two ways of viewing adoption, either as categories of adoption,

or phases of adoption. Both ways will be described in this chapter. There are similarities between the two, even though they are not completely exchangeable.

Firstly, Race (2003a; 2003b) has described four categories for customer adoption of web services:

1. *Enable enterprise integration*: organisations deploy WS as part of consolidating activities associated with accessing information from multiple legacy systems to lower the cost of IT. The organisations also wish to accomplish "virtual data integration" solutions in order to provide common access to data across business units.
2. *Establish and automate self-service processing*: solutions covered here focus on establishing and automating self-service processing in an effort to reduce costs through more efficient transactions such as order status and available to promise (ATP). Most organisations deploying these solutions do so on top of their existing B2B investments and view WS as a complementary rather than replacement technology.
3. *Grow the number of trading partners for existing services*: organisations deploy WS technology in the context of migrating to a services-oriented architecture while driving more connections with existing trading partners. The extent to which integration is made reusable makes a better case for ROI for organisations that have not seen a payback on their e-Business investment.
4. *Develop new business services, create new channels*: covers the development of new business services whereby an organisation creates a new line of business based upon enabling access to core intellectual property that is offered as an outsourced service to new trading partners by utilising WS technology to expose legacy functionality to new trading partners.

These four categories are not mutually exclusive, and an organisation can move between categories depending on how their usage of WS evolves. The second WS adoption approach is described by Marks and Werrel (2003), who view adoption as consisting of four distinct phases:

1. *Integration*: initially, internal system integration projects will be in focus for experimentation with WS, due to the vast number of information sources created by proprietary application implementations. Some SOAP-enablement of legacy applications, ERP and CRM systems will also be targeted. There is an increase of shared information across the business. The phase prepares organisations for phase two.
2. *Collaboration*: it will drive process and operational improvements in many business areas, if integration hurdles can be overcome, and tools and technologies are mature enough. There is experimentation with WS outside firewalls, and an increased interaction with other organisations. In particular, trading partners implement WS to drive shared value, for example to enhance value chain benefits. The phase prepares organisations for phase three.
3. *Innovation*: organisations will devise completely new ways of doing business based around web services. Lessons learned from the first two phases are applied to new processes and business models. New, distributed WS processes and applications now drive the business change. As WS are applied in new ways, dramatic business results are achieved, which drives new value propositions. The phase prepares organisations for phase four.
4. *Domination*: the culmination of the previous three phases. First movers begin to assert their dominance over markets and industries, by innovating new business models as well as out-executing competitors. WS leaders win through rapid innovation and cycles of learning. New company and industry structures are created as boundaries are redefined.

Some similarities between the two WS adoption descriptions exist, as mentioned. One concerns the focus on integration, with an emphasis on initial internal integration. Another is the enablement of new business opportunities, derived by WS usage. It seems that the first division, however, is more focused on reasons for adopting WS, while the second is focused on how adoption is carried out.

2 Business values

There are different types of business values for web services. This chapter introduces a summary of literature findings. One of the visions for WS is easier inter-operability for B2B, easier deployment and easier construction (Valtech, 2001). Many promises are made as to what WS may bring. Some say that WS offer a powerful business case, since it realises substantial operating savings within six to twelve months, while requiring only modest investments (Hagel, 2003). Achieving the value of web services is a critical issue to success. The potential for value creation is to be able to do more with less, to do it better, and to do it for less (Murphy and Stoyanova, 2003).

The standards-based approach enables organisations to leverage the ubiquitous standards. One example is HTTP servers, that are present almost everywhere, and the WS core standards are accepted widely. All in all, WS means organisations can focus on creating and delivering services to customers, employees and business partners rather than worry about system compatibility (Roby, 2003).

When describing the value of WS, some literature sources do so by comparing WS technology with traditional solutions, e.g. those for e-business. A few examples are given in Table 1.

Traditional technology	**WS technology**
Traditional integration, such as scaling point-to-point solutions, is costly and complex, making the traditional platform expensive (Race, 2003a; Murphy and Stoyanova, 2003; Colan, 2003)	Back-end systems information is accessible and connectible to higher levels in the standards stack to enable solutions without the tightly coupled interfaces associated with traditional EDI (Race, 2003a; Colan, 2003)
	The chief difference between WS and its predecessors is their reliance on Internet and WWW methods used by the former systems (Estrem, 2003)
In the past, there was a heavy burden of integration. When applications changed, customised inter-connections needed to be changed as well (Smolnicki, 2003).	WS bring businesses much closer to real-time data sharing among trading partners. With WS, the standardised interface connections remain functional even as organisations rework the applications (Smolnicki, 2003)

Table 1: Traditional vs. WS technology

A summary is that new integration technology provides new opportunities to rapidly connect business offerings, which means that web services reduce costs and extend the reach of collaborative automation (Murphy and Stoyanova, 2003).

Business values can be divided into business/organisational aspects and technological aspects. Both divisions will be presented in the remainder of this chapter.

2.1 Business/organisational aspects

Business, or organizational, aspects cover issues that matter from a strategic perspective. They contribute to enhancing a company's value to customers and other stakeholders.

2.1.1. Higher revenues

WS make it possible to create and/or overcome competitive pressure. New markets can be opened, for example by enabling access to legacy system functionality. In the end, organisations are enabled to participate in dynamic business (Clabby, 2002). In this sense, web services enable organisations to redesign their business to become service-oriented (Murphy and Stoyanova, 2003). Market shares can be increased and services can be available in real-time. Many organisations expect to generate new ways of collaborating between companies, and hence new revenue opportunities by using WS (Azzara, 2002; Marks and Werrel, 2003).

2.1.2. Lower costs

WS enable organisations to provide services to other organisations, without having to exchange their internal systems (Race, 2003a). Increased effectiveness means that software procurement, deployment and integration bring reduced costs (Marks and Werrel, 2003).

Another aspect of increased efficiency is to reduce maintenance, administration and service costs in benefits and payroll management (Dunn, 2003). WS can help enable such savings through seamless integration with benefit and payroll providers.

Cost is very closely associated with time, since more time spent usually means more resources spent, and a potentially smaller market segment. Since existing systems can be utilised, e.g. through reuse (Barry, 2003), costs of entering the WS hype are lower than for other technology types. IT capabilities can also via WS be aligned with business needs by providing richer sources of value and lower running costs. The Return On Investment (ROI) is therefore improved to that of historical integration tool-sets (Syntegra, 2002). Besides in-house cost factors, integration between partners is simplified and cheaper due to the broad adoption of WS as an integration technique (Barry, 2003). Maintenance costs may also be reduced because of packaged software. Another aspect is that administration costs and cycle times can be reduced by the previously mentioned integrated contract assessment, procurement/order tracking etc. (Dunn, 2003).

2.1.3. Exposing and consuming services

One of the most common uses for WS is to expose legacy system functionality in a new way, to e.g. customers and partners (Race, 2003a; 2003b). In this way, services that can be sold to others are provided using a flexible interface, while services that can be bought by others are accessed in the same manner.

2.1.4. Better usage of intellectual resources

Besides providing new services to others, WS enable organisations to outsource business processes or functions to a co-ordinated service provider (Smolnicki, 2003). This follows on the requirement to prepare the technology roadmap before entering into WS. With a carefully planned roadmap, it is easier for organisations to select a suitable combination of in-house operations and outsourcing that best serves the organisation's needs. There is no longer a need to have all needed functionality within the organisation, but a chance to select WS to access functionality provided externally (Smolnicki, 2003). This bridging of heterogeneous applications

and environments ensures optimum utilisation of existing resources (Marshman, 2002). Staffs are enabled to focus on their core competences.

One pressure often spotted in literature is that of businesses having to become more productive. One potential benefit of WS is that they enable an increase in productivity both for IT departments (Syntegra, 2002; Barry, 2003), application developers (AmberPoint, 2002), and end-users (Clabby, 2002; Fletcher and Waterhouse, 2002). As an example, IT personnel can become more responsive to the needs of the organisation.

2.1.5. Enabled co-operative integration

One aspect of being able to share information between organisations is the opportunity to, via WS, use collaborative planning, fulfilment and replenishment (CPFR). This may provide real - time access to inventory levels, forecasts, and customer demand data in a firm's distribution channels and supply chain (Dunn, 2003). Furthermore, WS can be employed to reduce relationship interaction costs, while increasing information by enabling true 360-degree views of employees, suppliers, customers, or partners (Dunn, 2003). This can be achieved by eliciting information across all touch-points.

Another important factor affecting the business value of WS is B2B integration. Integration, and effective one at that, seems to be the key benefit of implementing WS in the eyes of the IT professionals (Azzara, 2002). Integration concerns e.g. application integration both internally in an organisation, and externally with others across firewalls (Marks and Werrel, 2003). Web services can thus be used for any kind of integration (Colan, 2003). Integration must be teamed with management (Murphy and Stoyanova, 2003). The use of open standards fosters inter-connection of extended enterprise value chain participants, and WS technology promises to further streamline supply chains and simplify business processes, reduce human touch-points, cut transaction costs, and improve customer service (Smolnicki, 2003). One example is that WS can provide integrated contract assessment, procurement/order tracking, invoicing/billing, receiving and payment (Dunn, 2003).

2.1.6. Reduced time cycles

Collaboration and real-time access to information results in reduced inventory costs, decreased cycle times, and increased visibility to close gaps in demand and supply planning (Dunn, 2003). By reducing time needed for a cycle, business operations become more efficient, and products and/or services can be delivered to customers in shorter time.

2.1.7. More efficient business processes

The more productive use of existing intellectual capital in WS can, as mentioned, create new revenue streams (Fletcher and Waterhouse, 2002). One approach is through business process management, which can be used to create new organisational efficiencies. In fact, WS can complete business processes in relying on partners and standard-bearing entities, e.g. concerning foreign exchange translations, business entity lookups, and Zip code determinations (Dunn, 2003). Access to existing systems using WS provides more flexibility in that processes rather easily can be reconfigured and optimised.

Thanks to industry standards (e.g. XML, SOAP and WSDL), and the WS message structure, WS bring the opportunity to make use of business content and context to improve security, gain additional real-time information on business activities and quickly respond to opportunities (AmberPoint, 2002). Smaller companies as well as large ones can therefore participate more easily in Electronic Data Interchange (EDI) (Barry, 2003). EDI-based transactions are common in B2B

activities, and WS can therefore be used to spur collaboration between businesses. If all partners in a co-operative network all use the same standards approach, the need for separate integration projects with each partner is practically removed. Furthermore, as with legacy systems, processes that previously were manual or offline can with WS be realistically considered for automation and migration to the Internet (Colan, 2003).

2.1.8. Faster time-to-market

Simplified integration actually enables automation. Automation can, for example when sending updated data automatically instead of re-entering from computer-printed reports, eliminate errors and reduce staffing requirements (Colan, 2003). Automation is a way of creating stronger relationships between organisations, and to get products and services to market faster (Smolnicki, 2003; Clabby, 2002). WS enable a faster time-to-market approach (Smolnicki, 2003; AmberPoint, 2002; Clabby, 2002). This is also a convincing factor for many executives to start adopting WS. Business managers can respond quickly and intelligently to fast-breaking opportunities through the WS flexibility, particularly compared to traditional application generations (AmberPoint, 2002). The ability to have information technology solutions quickly reflect changes to business processes is one key benefit of WS (Azzara, 2002). This is related to easy and even instant web-based access to services.

2.2 Technology aspects

Technology aspects are more clearly related to issues within the utilised IT systems.

2.2.1. Platform independency

One web service benefit is that services can be ubiquitously accessed from any platform (Marshman, 2004). This means that services are exchangeable regardless of the kind of technical platform used.

2.2.2. Component thinking

With a WS approach, certain functionality in these suites can be provided as part of a base package, to which more function could be added as separate parts. It would give the user the ability to dynamically compose applications based on their needs, and also opens up a range of new pricing and distribution models for software vendors (Estrem, 2003). One potential consequence could be a shift from licensing and ownership of application software towards subscription models or usage-based fees. There could also be a potentially greater control of access to product, reducing losses caused by piracy. Another benefit may be better and cheaper customer service (Clabby, 2002).

2.2.3. Reuse is enabled

One aspect that helps cut development time is the possibility of reuse of software code instead of duplicating it. The reuse can be in terms of using software packages to a greater extent (Barry, 2003). Service-based solutions can be created by reusing existing applications. In this way, the life cycle and usefulness of current applications can be extended, and life cycle costs of integration are reduced (Azzara, 2002). The linkage between business and IT therefore becomes more effective, and the productivity of IT departments is increased (Syntegra, 2002).

2.2.4. Decoupling of interfaces from underlying logics

The interface is decoupled from the underlying logic, allowing the logic to be changed as necessary, provided the overall interface is maintained. True decoupling means that a system is less impacted by changes in components caused by business needs (Marshman, 2002). There is thus a clear relation here to component thinking.

WS are often realised as middleware, or application packages. Such middleware has emerged in the past years to tie business systems together to perform transactions and information exchange across organisational boundaries (Marks and Werrel, 2003). Through its flexibility, WS make the organisations' application portfolios more dynamic (Fletcher and Waterhouse, 2002). Existing products, like legacy systems, can be repackaged to better reach or serve existing markets. The middleware can in this case be used as interfaces, which incorporate WS standards to define how data will be requested and passed. Any other application with a similar interface can then connect to the interface and exchange data, which is less expensive to implement than customised code (Smolnicki, 2003; Syntegra, 2002; Clabby, 2002).

2.2.5. Flexible use of legacy system information

Legacy applications can be encapsulated using WS interfaces that provide access to their functions (Estrem, 2003). XML-based WS enable organisations to make use of business information within their applications. Messages sent using XML-based WS contain tags about the data itself. Since XML is structured, it is possible to read the tags, and hence gather and manage meaningful business information in real-time (AmberPoint, 2002). Besides content, contextual data (e.g. user profile information) are also enabled using WS. The combination of content and context enables WS to adapt and reconfigure itself depending on the audience requesting it (AmberPoint, 2002).

2.2.6. Architecture flexibility through loose coupling

Web services open new markets for organisations with minimal effort and a bring a reduced need for new investments. Combining WS with Enterprise Application Integration (EAI) tools and middleware, there is an opportunity to create loosely coupled distributed applications that can be dynamically located and invoked to accomplish a given task (Estrem, 2003, Syntegra, 2002). Furthermore, in traditional integration, programmers make direct calls through the Application Programming Interface (API), which are then compiled directly into the programs. APIs and file formats may change, however. With web services and XML, programs become more tolerant to changes in the data and SOAP can replace the use of conventional APIs (Colan, 2003).

Some people say that WS are ideal for simplified application integration of internal systems, or for linking software via the Internet (Cape Clear, 2002; Thelin and Murray, 2002; Clabby, 2002; Murphy and Stoyanova, 2003; Azzara, 2002). In a way, WS can be regarded as the grammar for integration.

2.2.7. Reducing development resources

Since knowledge of the implementation details is not necessary, more people can create WS, which brings integration capabilities to the mainstream developer (Colan, 2003). With less knowledge required, WS become rather easy to create, configure and reuse, which in turn makes integration easier. This "ease" has also brought new possibilities to support integration scenarios that previously were impossible or uneconomic to implement (Roby, 2003). One reason may

have been systems incompatibility problems, whether internal or external to an organisation. WS may resolve these problems (Fletcher and Waterhouse, 2002).

It is not only the applications themselves, such as middleware, that are affected by WS, but their development may be affected as well. One of the most commonly mentioned potential business values with WS is that it is possible for organisations to speed up the design and development of applications (Estrem, 2003; AmberPoint, 2002; Valtech, 2001; Fletcher and Waterhouse, 2002; Azzara, 2002). WS reduce the amount of software that needs to be written or integrated (Wong, 2002). Using WS is therefore a way to lower the barriers to integration, and thereby also to reduce costs, time and associated risk. According to Valtech (2001) and Colan (2003), development is affected in reducing not only the needed time, but also efforts, errors and costs of creating inter-operable systems. Furthermore, services are declared in a human-readable format, which makes it easier for developers to understand them (Marshman, 2002). WS bring application creation closer to developers not familiar with implementation details. The developer is therefore shielded from the complexity of e.g. legacy systems (Estrem, 2003; Roby, 2003). The underlying technology no longer becomes an issue to worry about. At the same time, application developers are enabled to work with state-of-the-art technology (Azzara, 2002).

3 Advice to beginners

Organisations that are about to go into web services need to make a number of considerations and plans. In the beginning of this report, there is a quotation saying more or less that the business strategy is at least as important as the technology. This chapter summarises some advice to organisations that are to start with WS, or even to those who already have started. The three advices are: analyse the business, analyse the technology, develop business cases. Rounding off the chapter is a section on some lessons learned from previous cases.

3.1 Analyse the business

Before getting started with web services, organisations must first make sure they have a clear vision of the company goals and how to get there. There are three sub-activities involved here:

- Define business goals: The first preparation is to make a clear definition of business goals (Race, 2003a). The organisation must know what its core is, and where it wants to go in the future. There is thus a need to define why WS should be used, and for what. Web services should not be used simply because it is the latest "buzzword" or because everyone else uses them (Murphy and Stoyanova, 2003). They should fit into the overall business strategy.
- Analyse the cultural shift: Organisations that have operated in a traditional fashion must prepare the organisation to adopt a new culture to share enterprise information (Dunn, 2003). Incorporating new technology and new services will have consequences for the way of working. Having timely and information-rich connections is very important, but the culture and business relationships must be open and trusting to get there. One means is to leverage organisational knowledge by learning about the basic terminology and concepts in WS (Wong, 2002). Besides selling the ideas of WS use inside an organisation, it is also essential to keep an eye on competitors to see how fast they plan to utilise WS technology (Marshman, 2002).
- Develop a business roadmap: The business roadmap is closely related to business goals, since organisations must allocate resources to activities needed to reach the goal. Part of this includes a focus on what stakeholders of various kinds need and desire, and making sure that they have access to the right information if all partners are to be efficient and productive (Dunn, 2003). The sought solutions should facilitate integration of partners.

Organisations should aim at syndicating WS to multiple partners without modifications (Wong, 2002). Part of this includes a need to identify which partners to integrate with, provided the WS use is external.

3.2 Analyse the technology

An analysis of existing technological architectures and desired future ones is imperative for successful WS transitions (Dunn, 2003; Race, 2003a).

- Analyse the current architecture: WS are about building and linking atomic processes into business processes. Application developers need to consider what WS are supposed to solve and support, to allow the entire infrastructure to be leveraged through seamless integration (Dunn, 2003). Existing applications should be identified that can be targets for the WS efforts. This means applications that partners would like to incorporate from an organisation, or vice versa (Wong, 2002). One important aspect is to have a preference for applications whose logic can be converted into WS.
- Develop a technology roadmap: Once the current technological infrastructure has been analysed, it is time to focus on which changes that are needed, and how to achieve those changes. There should be tight connections to the business needs (Race, 2003a). Processes can be deconstructed and reconstructed accordingly. The roadmap includes a definition of which focus WS transition should take, which in this case means to use WS internally and/or externally. Furthermore, the technology to be selected should be the one with the highest potential for impact given current capabilities of the technology (Hagel, 2003).

3.3 Develop business cases

Following the technology roadmap, there is a need to develop business cases to identify how the internal and/or external WS usage should be undertaken and why.

- Develop a business case for internal WS use: The organisation must know what its core is, i.e. what to keep inside the organisation (Race, 2003a). As mentioned, applications suitable for internal integration and bridging should be identified. When such preparations have been made, a small internal prototype project should be undertaken using WS (Wong, 2002).
- Develop a business case for external WS use: This includes an identification of what functions that can be outsourced to trading partners or service providers. Such functions should be non-critical (Murphy and Stoyanova, 2003). Many organisations start with internal WS projects before moving to external WS. If so, they may utilise the lessons learned from these projects when taking advantage of WS with partners (Wong, 2002). According to Murphy and Stoyanova (2003), the externally facing web services focused on inter-company collaboration will have the highest real value.

Regardless of whether the business case refers to internal or external WS, organisations must develop a clear migration path to evolve to a service-oriented architecture (Hagel, 2003). The path should include a compelling economic rationale for both the organisation and its partners. This requires a deep understanding of all stakeholders' economic and strategic concerns (Hagel, 2003).

3.4 Lessons learned

There are many efforts under way concerning web services. Whenever possible, lessons learned from these projects should be taken into consideration. The following is a brief summary of some additional lessons, besides those already described in the previous sections:

- Get upfront agreement: issues such as definitions, business models, common processes and payment system should be considered early (Murphy and Stoyanova, 2003).
- Build trust: partition information, share results, and consider security and improvements (Murphy and Stoyanova, 2003).
- Plan ahead: adhere to any set standards, create a service-oriented architecture, make the infrastructure reliable, and consider performance needs (Murphy and Stoyanova, 2003).
- Execute well: again, reliability and availability are important issues, as is performance, manageability and security (Murphy and Stoyanova, 2003).

4 Challenges

Web services hold great promises, but there are some aspects to consider as challenges, or even potential pitfalls.

4.1 Standards-related challenges

WS standards are still relatively immature and incomplete. The core standards (SOAP, WSDL and UDDI) are exceptions, they are rather well developed. However, these basic standards do not adequately cater for issues such as security, transactions, workflow, orchestration, user interaction, quality of service (QoS), or trust management (Smolnicki, 2003; Estrem, 2003; Dunn, 2003; Wong, 2002). Some even are becoming fragmented (Marks and Werrel, 2003). In some respects, standards are lacking from B2B integration and automation (Marks and Werrel, 2003). Inconsistent platforms, languages and protocols are other hindering barriers to WS success (Dunn, 2003). Nevertheless, standard interfaces will be preferred over proprietary solutions, and standards for interactions in general must be developed and embraced (Govern and Weagraff, 2003). There is thus a need for organisations to also manage standards such as these internally (Murphy and Stoyanova, 2003).

4.2 Interoperability challenges

Vendor implementations also typically lag behind the capabilities that are defined in the standards, or only conform to parts of the standards. There is no general process for adopting WS technology (Wong, 2002). Some organisations building WS solutions may therefore be force to limit their scope to fit within the limitations of the protocols. Especially with security, many organisations have concerns. There is a lot of data transferred using standards that have no built-in security mechanisms, and WS security standards are not yet available (Smolnicki, 2003).

Furthermore, there are many different vendors introducing WS application environments. These vendors promise inter-operability, application portability, code reusability, scalability, security, etc., but it remains to be seen if they really will be capable of conforming to the WS standards to a degree that fully enables inter-operability. Implementation costs and timeframes must be minimised (Govern and Weagraff, 2003). Vendors do co-operate on some technical challenges, though, e.g. in making objects self-describing, easily discoverable, secure and accessible over the web (Dunn, 2003). The technological focus is actually one potential problem of WS, since the market seems to focus on tools and protocols rather than building solutions (Wong, 2002). Some dominating quality architectural concerns are interoperability, ease of integration, customisability, and adaptability (Govern and Weagraff, 2003). Architectures must support the possibility of long-running transactions that require human intervention at specific steps (Govern and Weagraff, 2003). Finally, more complex integration solutions are still a threshold for using WS today (DPZ, 2002). Such complex solutions include operational and workflow processing, with sophisticated business process and workflow automation capabilities.

4.3 New opportunities challenges

For each organisation interested in moving to standards, it is important to consider what new initiatives they can launch because they have web services. Isolated WS do not solve the real business problem. The focus should be on syndicating internal applications to business partners to encourage and support product sales (Wong, 2002). According to Murphy and Stoyanova (2003), the new business value and higher Return On Investment (ROI) comes from a combined effort of creating real time dynamic business services, collaboration with business partners, and from optimising business processes. Many service providers will in fact operate in multiple business contexts, and solutions they use must therefore enable context switching without requiring fundamental changes in the architecture (Govern and Weagraff, 2003). Most businesses do not care about specifications of new parts of a product, but rather want the entire product to bring value as quickly as possible. Enterprises should focus on solutions not previously possible, such as providing partners access to their internal product systems (Wong, 2002). The challenge for accomplishing this focus is the difficulty to cost-justify projects to senior management (Hoffman, 2002). Customers will also require more control, for example in direct control of services, process intervention opportunities, tailored interactive experiences, privacy and security control of personal information, and state-of-the-market on-line capabilities (Govern and Weagraff, 2003).

4.4 Knowledge and skills challenges

Another important aspect is that many IT staff members are rather inexperienced in WS implementation (Smolnicki, 2003). Without people skills, the technology will not be utilised in the desired or intended way. Educating those who will manage, develop, and plan for WS is therefore necessary to foster adoption of the technology. One challenge is thus also to support workforce dynamics with increased freedom from restrictions of location, time or devices (Govern and Weagraff, 2003). Organisations must also know when NOT to use WS (Smolnicki, 2003). For example, WS provide loose integration and are effective at opening windows to previously inaccessible data, but are not as effective at helping to provide a reliable unification of data repositories. The advantages of WS are still also mostly intangible, which means that they are difficult to realise in a short-term perspective (Syntegra, 2002). Careful planning is necessary, since informed decisions will make better ground for WS success. Furthermore, lessons learned from e.g. Enterprise Application Integration (EAI) and Object Orientation (OO) should be taken into consideration (Murphy and Stoyanova, 2003).

4.5 Legal and financial challenges

Strong challenges reside in legal and financial domains. Some examples are: protection of customer data privacy, intellectual property protection, acceptable cost-sharing and pricing models, vendor dependencies, no legal recourse for web service non-performance, and the ability to share ownership of customer relationships (Govern and Weagraff, 2003). These challenges will become increasingly important as the scope of integration broadens. Management therefore need to address such aspect early on in the collaborative effort.

5 Summary

In this report, one comparison with traditional technology has been presented, along with 10 aspects of business value for WS. Looking at the 10 aspects, they can be divided into two main groups: technology and business. Technology aspects refer to a focus on what the technology enables organisations to do on a more technical level, while business aspects refer to more strategic and high-level benefits. Four values belong to technology: integration, automation,

middleware & applications, and application development. Six values belong to business: increasing revenues & enhancing competition, providing and consuming services, business information exchange, time-to-market, enhanced productivity and efficiency, and lower costs.

However good their promotion is, there are challenges for WS that must be addressed. By being aware of these challenges, organisations can make more informed decisions regarding WS, which also means that they make better ground for reaching the business values they desire. Delivering value to the enterprise is one of the major hurdles to WS success (Evans, 2002). There is a need to develop industry examples of successful WS implementations and identify how WS truly can serve the business needs of its users.

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