

# Business-IT Alignment and Service Oriented Architecture

## *A Proposal of a Service-Oriented Strategic Alignment Model*

Llanos Cuenca<sup>1</sup>, Andrés Boza<sup>1</sup>, Angel Ortiz<sup>1</sup> and Jos J. M. Trienekens<sup>2</sup>

<sup>1</sup>Research Centre on Production Management and Engineering (CIGIP), Universitat Politècnica de València, Camino de Vera s/n Valencia, Spain

<sup>2</sup>University of Technology Eindhoven, Eindhoven, The Netherlands

**Keywords:** Service-Oriented Architecture, Business-IT Alignment.

**Abstract:** Since its inception, SOA has been postulated as the solution to the problems of alignment between business and IT. However, these problems still remain, especially at external level where the business strategy should be aligned with the IT strategy. Based on the Henderson and Venkatraman's strategic alignment model and the literature review of strategic aspects in SOA this paper proposes a Service-Oriented Strategic Alignment Model (SOSAM) in order to achieve business services and information technology external strategic alignment. The business strategy includes the definition of business service scope, the distinctive business service competencies and the business service governance; and the IT strategy includes the definition of technology service scope, the service systemic competencies and the service governance.

## 1 INTRODUCTION

The current situation dominated by globalization forces competence between enterprises. As a result, supply chains and networks are now looking to enforce collaborative agreements, which would produce more efficient workflow, flexibility, effectiveness, agility and coordination between chain links (Vargas et al., 2013). The competitive advantages in the changing business environment have transferred organizational structures from single enterprises to extended or collaborative enterprise network (Cuenca et al., 2011a; Boza et al., 2014). The cross-organisational business process in a business network which has to be optimised, concerning synchronized work-sharing of network actors, is considered as the central design subject of collaborative production. Hence, the service-orientated approach enables enterprises to define sub-processes as services and to link them flexibly to process chains (Vanderhaeghen et al., 2007).

Service-Oriented Architecture (SOA), has emerged as new generation technology architecture in this area. SOA represents the latest trend in integrating heterogeneous systems it provides guidelines on how services are described, discovered and used.

Although in practice there is an emphasize on the IT side of SOA (Lewis et al., 2007), the conceptual vision of SOA does not only incorporate business and IT, but also architectural goals, governance models and policies to foster enforcement of standards and technical requirements of SOA over time (Marks and Bell, 2006). There are three major steps necessary to reach Business-IT alignment: identifying the requirements and strategies for achieving alignment; identifying the components of alignment that are required; identifying methods, techniques, and tools that can enhance Business-IT alignment (Chang et al., 2009).

In this sense, this paper proposes a Service-Oriented Strategic Alignment Model (SOSAM) in order to achieve business services and information technology external strategic alignment.

The structure of the paper is organised as follows: first, Section 2 and section 3 offer a review of business-IT strategic alignment and SOA concepts respectively. Section 4 proposes the Service-Oriented Strategic Alignment Model (SOSAM) for the business services and information technology alignment through the definition of the components included in business strategy and IT strategy. Finally, Section 5 provides a summary of the conclusions.

## 2 BUSINESS AND IT ALIGNMENT

Supply chains and collaborative networks have to be able to manage the technological complexities of their information systems and information technology, while ensuring that these generate added value to business processes. This can only be achieved if there is an alignment between business and IT (Vargas et al. 2013; Cuenca et al., 2011a).

According to the most important elements provided for several authors suggest the following definition for strategic alignment: “The strategic alignment of business and IT is a dynamic and continuous process that enables integration, adjustment, consistency, understanding, synchronization and support between business strategies and strategies of IT, in order to contribute and maintain the correct performance of the organization, creating a competitive advantage that is sustained over time”.

The foundation bases of SAM are theoretical and not practical. In this sense, Luftman (2000) introduces the alignment maturity model (AMM) as a practical component. This model is based on the concepts that are treated conceptually in the SAM, but also incorporates a practical aspect to the field of strategic alignment, proposing a model to measure the degree of maturity of the alignment between business and IT, enabling the company that applies it to identify, how it is, where and how to improve.

Several authors have extended or used SAM from different conceptual aspects seeking to ensure strategic alignment (Maes, 1999; Wang et al., 2008; Hu and Huang, 2006; Mekawy et al. 2009 and Dong et al., 2008). Other authors have made their research and findings based on the AMM to propose practical conceptual models (Adaba et al. 2010; Bagher et al. 2010). However, all previous models can only be applicable to the individual business; some authors have proposed few models for alignment in the inter-enterprise context (Santana et al., 2008; Pijpers et al. 2009; Cuenca et al. 2011a).

SAM is composed of four domains that consist of three components each. These twelve components define what each quadrant is as far as alignment is concerned. All the components working together determine the extent of alignment for the company being assessed (Henderson and Venkatraman 1993, Papp 2001, Sakka et al. 2010). Different approaches have been raised in the field of alignment in enterprise collaboration; Chituc and Azevedo (2005) emphasize the importance of the business view that allows collaborative networks to be regarded as

combinations of inter- and intra-enterprise business processes. VERI (Gall and burn, 2007) is designed to measure the espoused readiness of an organization to collaborate virtually and the actual preparedness to operate virtually. Santana (2009) proposes ICoNOs MM, a two dimensional maturity model (MM) that addresses five levels of maturity as well as four domains to which these levels apply: partnering structure, information system architecture, process architecture and coordination. Alonso et al. (2010) define a maturity model, named ECMM (Enterprise Collaboration Maturity Model), with the main objective of assessing organizations that desire to know their collaboration and interoperability maturity level with respect to a set of best practices. Vargas et al (2012; 2011) analyze, relate and synthesize the research that has addressed the disciplines of collaboration and strategic alignment, both individually and jointly, in order to identify possible future lines of research from conceptualization performed. Cuenca et al. (2011b) propose the elements to be included into the enterprise architectures in order support the alignment between business strategy and IT strategy in extended enterprises from an enterprise engineering perspective. Da Piedade et al. (2012) introduce an approach to alignment measurement leveraged by the new paradigm of performance prediction and present an alignment metric for collaborative networks.

These proposals do not take into account the service-oriented approach. The objective of this paper is centred in the external perspective of the alignment (Business strategy and IT strategy domains) and how this alignment is tackled in oriented-service architectures.

## 3 SERVICE-ORIENTED ARCHITECTURE

Within SOA the main focus is to decouple business processes from applications and systems (Deb et al., 2005). As a result, business models and applications can evolve independently. A vital role in this process is played by business services, which are services used by (high-level) business processes (Deb et al., 2005; Erl, 2005; Dow et al., 2008). Because these business services can employ other business and/or application services to serve a specific business function, discovering and creating suitable business services is one of the key success factors in achieving the main goals of a business-driven SOA

(Deb et al., 2005). The single term Business Service is used to mean some goods or service that a business component offers to other business components and/or to external parties. A Business Component is a part of an enterprise that has the potential to operate independently, in the extreme case as a separate company, or as part of another company. A business component is a logical view of part of an enterprise that includes the resources, people, technology and know-how necessary to deliver some value. Service orientation enables the definition of components with well defined boundaries. To achieve the desired business outcome, these components collaborate with other components through services. A Business Service is a reusable combination of IT components that delivers a business oriented service. In SOA, software applications are packaged as services. Services are combined according to certain business logic to deliver specific functionality and quality of service. Each service has an associated declarative policy that specifies quality of service, availability, and other attributes necessary to meet the overall business process goal. A service is considered an abstract business concept that represents the functionalities of business (Iacob and Jonkers, 2009). According to Chen (2008), to achieve competitive advantage, challenges remain regarding how to “orchestrate” the lower level IT infrastructure services to deliver the desired business-level customer services or to effect service innovation that increases firm performance in a fast changing regulatory and competitive environment. Simply put it, the issue is how to align IT with business. A service in a business sense is defined as a provider client interaction that creates and captures value (IBM, 2004). Within IT, a service is defined as a self-contained, distributed component with a published interface that supports interoperability, is discoverable, and is dynamically bound (Crawford et al., 2005). The wide disparity of definitions is fundamentally a problem for business-IT alignment—the two communities see services as very different things. Although “services” in the computing sense differ from service concepts in the business sense, service orientation embraced by both the business and IT communities presents an unprecedented new opportunity for alignment. Using coarse-grain services as a binding force, SOA allows for a potentially truer alignment with business goals. We can expect service-oriented enterprise requires a flexible and robust IT infrastructure to model, assemble, integrate, and manage business processes and deliver cost-effective, modular and scalable

service innovations that are customized to the enterprise’s requirements, timetables and priorities. It is necessary to define service interactions between business components (Chang et al., 2009). Different approaches have been arising in the field of alignment in service-oriented, Shishkov et al. (2006) propose a design approach addressing the problem of business-software alignment. Chen (2008) proposes BITAM-SOA framework with the aim to consider all these aspects by combining SOA, engineering alignment methods, enterprise architecture, and business performance management. Schepers et al. (2008) propose a lifecycle approach to SOA governance. Antikainen and Pekkola (2009) identify several factors influence the alignment of SOA development with business objectives. Abdi (2010) develop a model which explains the interplay between strategic alignment dimensions of governance, communication, and architecture enabled by SOA, and enterprise agility. Joachim et al. (2013) show how SOA governance affects IT flexibility and reuse. An empirical evaluation based on data from 81 firms using SOA reveals the differential impact of various SOA governance mechanisms (structures, processes, and employees/relations).

These proposals cover partial aspects related to the external involved domains in the strategic alignment model, so they partially solve the problem alignment at this level. It is necessary to analyze and gather the necessities and solutions with the aim of ensuring the external alignment under a service-oriented approach. Identifying and defining elements to be incorporated in each involved domain will result in the proposal of the service-oriented strategic alignment Model (SOSAM).

#### **4 PROPOSAL OF A SERVICE-ORIENTED STRATEGIC ALIGNMENT MODEL (SOSAM)**

The objective of this paper is centred in the external perspective of the alignment (Business strategy and IT strategy domains) and how this alignment is tackled in oriented-service architectures. In this sense the starting point of the proposal is the identification of the business strategy domain and IT strategy domain and their components in a service-oriented approach in order to improve the strategic definition and alignment.

From the literature review we have identified the

strategic SOA concepts at strategic level. Then, we have classified them according to the components identified in SAM (Henderson and Venkatraman, 1993). From the results of the analysis we can conclude that in a service-oriented approach, it is necessary to take into account other aspects to ensure the alignment between business strategy and IT strategy.

The new components in Service-Oriented business strategy are defined as follow:

**Business Service Scope:** The business service scope includes everything that might affect the business service environment. It refers to markets, products, services, customers/clients, and the location of the business as well as buyers, competitors, suppliers, and potential competitors. The domain classification of the business service must be defined, such as, fundamental services, productive services, individual consumption services or public services. It includes the business components and the goods or services that a business component offers to other business components and/or to external parties. For each business component must be defined the resources, people, technology, the know-how necessary to deliver some value, and the reasons for component's existence. It includes the business processes of the collaborative network and processes needed for information exchange, the explicit aspects of the relationships, contractual basis and business management plans. (Cherbakov et al., 2005; Sanz et al., 2007; CCID Consulting, 2007; Tohidi, 2011)

**Distinctive Business Service Competencies:** It includes all the things that make the business service a success in the market place. This includes the core competencies of the business service that allows it to compete with other businesses services. This also includes the brand, research, manufacturing and product development, the cost and pricing structure, and the sales and distribution channels used by the business service. It contains the operations, and professional and specialized support offered as business services to business partners (or business process of other organization) in order to facilitate collaboration and created value. Relevant properties of the service, activities performed and necessary resources must be described. Distinctive contractual agreements, information sharing, communication, knowledge exchange, trust and commitment. (Bettencourt et al., 2002; IBM, 2004; Crawford et al., 2005; Deb et al., 2005; Erl, 2005; Sanz et al., 2007; Dow et al., 2008; Tohidi, 2011; Hachani et al., 2013).

**Business Service Governance:** This component

refers to the relationships that exist between the stakeholders of the collaborative network and senior management, mainly the board of directors. This also includes any governmental regulations and relations between other strategic business partners. It is necessary to define the new role of the users; it requires a change in attitude from people. They need to see their job as a value-adding service offered to consumers, instead of focusing on their own area of expertise. It includes collaborative decision making, governance structure and compliance, inter-organizational policies, roles and responsibilities specification, and communication-oriented coordination. It establishes executive accountability for the management and performance of the work and results. (Sanz et al., 2007; Schepers et al., 2008; Joachim et al., 2013)

The new components in Service-Oriented IT strategy are defined as follow:

**Technology Service Scope:** All of the essential information applications, technologies and software services that can be re-used and composed based on business needs. An associated declarative policy that specifies quality of service, availability, and other attributes necessary to meet the overall business process goal must be defined for each service. Include all the services offered and consumed by the business component. It must be defined opportunities and gap analysis, migration plan development, implementation of the plans and IS Target formulation. It includes the practical aspects of the relationship (e.g. level and methods of information sharing, communication channels, technology and knowledge exchange) (O'Brien et al., 2005; Tohidi, 2011; Hachani et al., 2013)

**Service Systemic Competencies:** The all capabilities that set the information technology services apart from the rest. This involves how much access the business services have to information that is important to the business's strategies. Each service has a well-defined interface which lists the operations it provides and the set of messages it accepts and sends in response, the application of resources for the benefit of another entity and the self-contained, distributed component with a published interface that supports interoperability. It includes organizational innovation to select and deploy incremental and innovative improvements processes and technology. Interoperability and Collaboration Technologies to standardize the usage of a set of baseline tools, techniques and methods for interoperability and collaboration must be defined. (Vargo and Lush, 2004; Crawford et al., 2005)

**IT Service Governance:** Describes the makeup

of the authority behind the information technology and how the resources, risk and responsibility, are distributed between the business partners, information technology management, and the service providers. It includes the selection and prioritization of information technology projects, the management mechanisms that the business component needs for autonomous operations, including metrics and procedures for motivation, performance, and accountability, the SOA strategy, aligning the organization, managing the service portfolio, controlling the service lifecycle, enforcing policies and managing service levels. It also requires the involvement of business management and of line-of-business employees. It must be defined the actions related to the management decisions, IT systems, training, methods and approaches that make the network operational, the training and competency development within the network workforce, and risk analysis. (Scheppers et al., 2008; Joachim et al., 2013).

## 5 CONCLUSION

This proposal analyzes and gathers the requirements and solutions to ensure the external alignment under a service-oriented approach. It covers all the aspects related to the external involved domains in the strategic alignment. The elements to be incorporated in each involved domain have been defined in the proposal of the service-oriented strategic alignment Model (SOSAM).

## REFERENCES

- Abdi, M.; Dominic, P. D D, 2010. Strategic IT alignment with business strategy: Service oriented architecture approach, *Information Technology (ITSim), International Symposium 3*, pp.1473,1478
- Adaba, G., Rusu, L. and Mekawy, M. 2010. Business-IT Alignment in Trade Facilitation: A Case Study. Organizational, Business, and Technological Aspects of the Knowledge Society. *Communications in Computer and Information Science. Berlin : Springer, Vol. 112*, pp. 146-154.
- Alonso, I. Martínez de Soria, L. Orue-Echevarria and M. Vergara, 2010. Enterprise Collaboration Maturity Model (ECMM): Preliminary Definition and Future Challenges. *Enterprise Interoperability IV, Part VII*, 429-438
- Antikainen, J.,Pekkola, S. 2009. Factors influencing the alignment of SOA development with business objectives. *17th European Conference on Information Systems*
- Bagher, H., Gardesh, H and Shadrokh, S. 2010. Validating ITIL maturity to strategic business-IT alignment. 2nd *International Conference on Computer Technology and Development (ICCTD 2010)*. pp. 556-551.
- Bettencourt, L. A., Ostrom, A. L., Brown, S. W., & Roundtree, R. I. 2002. Client co-production in knowledge-intensive business service. *Dalifornia Management Review*, 44(4), 100–128.
- Boza A., Cuenca L., Poler R. & Michaelides Z. 2014. The interoperability force in the ERP field. *Enterprise Information Systems DOI: 10.1080/17517575.2013.866697*
- CCID Consulting. 2007. 2006–2007 Annual report on the development of China's modern services industry. <http://www.en.ccidconsulting.com>. Accessed 25 Jan 2008.
- Chen H.-M. 2008. Towards Service Engineering, Service Orientation and Business-IT Alignment; *In: Proc. 41st Hawaii Int. Conf. on System Sciences*
- Crawford, C., Bate, P., Cherbakov, L., Holley, K., and Tsocanos, C. 2005. Toward an on demand service-oriented architecture, *IBM Systems Journal*, 44(1):81–107.
- Cuenca L. Boza A., Ortiz A. 2011a. Architecting business and IS/IT strategic alignment for extended enterprises. *Studies in Informatics and Control, Vol. 20, No. 1*. pp. 7-18
- Cuenca, L., Boza, A. and Ortiz, A. 2011b. An enterprise engineering approach for the alignment of business and information technology strategy. *Int. J. Computer Integrated Manufacturing, Vol. 24*, pp. 974-992.
- Chang, H., Hsiao, H., Lee, Y. and Chang J., 2009. Assessing IT-Business Alignment in Service-Oriented Enterprise. *Proceeding of Pacific Asia Conference in Information Systems (PACIS)*.
- Cherbakov L., Galambos G., Harishankar R., Kalyana S., Rackham R. 2005. Impact of service orientation at the business level. *IBM system journal*, 44(4) pp. 653-668.
- Chituc C-M. and Azevedo A. 2005. Multi-Perspective Challenges on Collaborative Networks Business Environments. *IFIP The International Federation for Information Processing Volume 186*,pp 25-32.
- da Piedade R. Francisco, Américo Azevedo, António Almeida, 2012. Alignment prediction in collaborative networks, *Journal of Manufacturing Technology Management, Vol. 23 Iss: 8*, pp.1038 – 1056
- Deb, M., Helbig, J., Kroll, M. and Scherdin A. 2005. Bringing SOA to Life: The Art and Science of Service Discovery and Design, *SOA Web Services Journal*, 27 Dec. 2005. (In Hiemstra et al., 2009)
- Dow, M., Ravesteijn, P., Versendaal, J. 2008. Assessing the Quality of Enterprise Services - A Model for Supporting Service Oriented Architecture Design, *Proc. of International Conference on Enterprise Information Systems (ICEIS 2008)*, pp. 50-57.
- Dong, X., Liu, Q. and Yin, D. 2008. Business performance, business strategy, and information system strategic alignment: An empirical study on Chinese firms. *Tsinghua Science and Technology, Vol.*

- 13, pp. 348-354.
- Erl, T. 2005. *Service-Oriented Architecture: Concepts, technology, and design*, The Prentice Hall Service-Oriented Computing Series, 2005: Prentice Hall PTR. (In Hiemstra et al., 2009)
- Gall, P., & Burn, J. 2007. Strategic alignment in the virtual organisation. *Paper presented at the European and Mediterranean Conference on Information Systems (EMCIS). 24-26 June.*
- Hachani, Lilia Gzara & Hervé Verjus 2013. A service-oriented approach for flexible process support within enterprises: application on PLM systems, *Enterprise Information Systems*, 7:1, 79-99
- Henderson, J. and Venkatraman, N. 1993. Strategic alignment: Leveraging information technology for transforming organizations. *IBM Systems Journal*, Vol. 32, pp. 472-484.
- Hiemstra, A., Ravesteyn, P., Versendaal, J.M. 2009. An Alignment Model for Business Process Management and Service Oriented Architecture. In: *6th International Conference on Enterprise Systems, Accounting and Logistics.*
- Hu, Q. and Huang, D. 2006. Using the Balanced Scorecard to Achieve Sustained IT-Business Alignment: A Case Study, *Communications of the Association for Information Systems*, Vol. 17, pp. 181-204.
- Iacob M. and H. Jonkers, 2009. A model-driven perspective on the rulebased specification and analysis of service-based applications. *Enterprise Inform. Syst.*, vol. 3, no. 3, pp. 279-298.
- IBM Research Report. 2004. Services science: A new academic discipline, [http://domino.research.ibm.com/comm/www\\_fs.nsf/images/fsr/\\$FILE/summit\\_report.pdf](http://domino.research.ibm.com/comm/www_fs.nsf/images/fsr/$FILE/summit_report.pdf).
- Joachim, N., et al. 2013. The influence of SOA governance mechanisms on IT flexibility and service reuse *The Journal of Strategic Information Systems* 22(1), pp 86-101
- Lewis A., Morris E., Simantra S. and Wrage L. 2007. Common misconceptions about Service-Oriented Architecture, iccbss, pp.123-130, *Sixth International IEEE Conference on Commercial-of-the-Shelf (COTS)-Based Software Systems (ICCBSS'07).*
- Luftman J. 2000. Assessing Business-IT alignment maturity. *Communications of the Association for Information Systems*, Vol. 4.
- Maes R. 1999. Reconsidering Information Management Through A Generic Framework. *Universiteit van Amsterdam.*
- Marks, E. A. and Bell, M. 2006. *Service-Oriented Architecture: A Planning and Implementation Guide for Business and Technology*, John Wiley & Sons, Inc. New York, NY, USA.
- Mekawy, M., Rusu, L. and Ahmed, N. 2009. Business and IT Alignment: An Evaluation of Strategic Alignment Models. *Best Practices for the Knowledge Society. Knowledge, Learning, Development and Technology for All. Communications in Computer and Information Science. s.l. : Springer, Vol. 49, pp. 447-455.*
- O'Brien L., Bass L., Merson P.F., 2005. Quality Attributes and Service-Oriented Architectures *Carnegie Mellon University Research Showcase Software Engineering*
- Papp, R. 2001. Assessing Strategic Alignment in Real Time. *Journal of Informatics Education Research*, (6, 1)
- Pijpers, V., Gordijn, J. and Akkermans, H. 2009. Aligning Information System Design and Business Strategy – A Starting Internet Company. *The Practice of Enterprise Modeling. Lecture Notes in Business Information Processing. Springer, Vol. 15, pp. 47-61.*
- Sakka O., P-A. Millet, V. Botta-Genoulaz 2010. An owl based ontology of scor model: A prerequisite for strategic alignment. *8th International Conference of Modeling and Simulation - MOSIM'10*
- Santana, R.; Daneva, M.; van Eck, P.; 2008. Wieringa, R. Towards a business-IT aligned maturity model for collaborative networked organizations. *12th International Conference on Advanced Information Systems Engineering. pp. 276-287, Munich.*
- Santana R. 2009. ICoNOs MM: The IT-Enabled Collaborative Networked Organizations Maturity Model. *IFIP Advances in Inf. and Com.Tech. Vol 307, pp 591-599*
- Sanz, J.L.; Becker, V.; Cappi, J.; Chandra, A.; et al. 2007. Business Services and Business Componentization: New Gaps between Business and IT. *SOCA '07. IEEE pp.271-278.*
- Schepers T. G. J., Iacob M. E., Van Eck P.A.T. 2008. A life-cycle Approach to SOA Governance SAC'08, pp. 1055-1061
- Shishkov B., M. Sinderen and A. Verbraeck, 2006. Towards flexible inter enterprise collaboration: a supply chain perspective, *Lecture Notes in Business Information Processing Vol. 24, 2009, pp 513-527*
- Tohidi H. 2011. Modelling of Business Services in Service Oriented Enterprises *Procedia-Computer Science Journal Elsevier USA Vol. 3, pp 1147-1156*
- Vanderhaeghen D., Werth D., Kahl T. and Loos P. 2007. Service and process matching- An approach towards interoperability design and implementation of business networks. *Enterprise Interoperability. New Challenges and Approaches part IV pp189-198*
- Vargas A., Boza A., Cuenca L., Scala I. 2013. Inter-Enterprise Architecture and Internet of the Future. *4th Doctoral Conference on Computing, Electrical and Industrial Systems (DoCEIS'13)*
- Vargas, A., Boza, A. and Cuenca, L. 2011. Towards Interoperability through Inter-enterprise Collaboration Architectures. *OTM 2011 Workshops. LNCS. Berlin : Springer, Vol. 7046, pp. 102-111.*
- Vargas, A.; Boza, A.; Cuenca, L.; Ortiz, A. 2012. The importance of strategic alignment in enterprise collaboration. *6th International Conf. on Industrial Engineering and Industrial Management, Vigo.*
- Vargo, S. L., R. F. Lusch. 2004. Evolving to a new dominant logic for marketing.: *J. Marketing, 68 1-17*
- Wang, X., Zhou, X. and Jiang, L. 2008. A Method of Business and IT Alignment Based on Enterprise Architecture. *IEEE International Conf. on Service Operations and Logistics, and Informatics. pp. 740-745.*