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Critical Factors in the Effective of Service-Oriented Architecture

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Abstract
Service oriented architecture is a style of architecture, design and develop service more flexible and reusable. Service-oriented architecture is a great challenge in the scientific and practical, and has done a lot of research in this field. But some studies have also shown that it has failed to implement the project. A major reason for failure is lack of knowledge about critical factor in the success of service-oriented architecture. This paper, Provided critical factors in the successful implementation of service oriented architecture and has reviewed Papers in this subject**.**
Keywords: *SOA, Service Oriented architecture, Critical Factors, Success*

1. Introduction

Although can not say who first used the term SOA[1], but it seems Yefim V. Natis and Roy W. Schulte was published the first evidence of SOA in 1996[1].Later specialists began to analyze the key concepts of SOA for the future software. So that in 2005 Gartner announced by 2008 Service-oriented architecture is composed of 80% overall software projects [2]. Actually service-oriented architecture designed a way to make and use of all aspects of the business services. SOA can be effective on information systems (IS) as a business processes, and information technology (IT) that process data and information in an organization. It can omit the limitations of traditional integration methods of software for best practices to align business and IT effectively[3, 4].IT artifacts, are software systems, software services, and hardware [5].Business artifacts are processes, organizational units, informational flows , responsibilities, and functional services[6].In recent years service orientation is discussed as a basic new design paradigm which improves the manageability and changeability of increasingly complex information system. Service orientation as a design paradigm is not limited to software engineering [7]. It offers complex solutions from a set of loosely coupled building blocks, IS engineering objectives and thus goals of IT/business

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[1] Service Oriented Architecture

alignment are also supported. The main goal of service orientation is to increase the flexibility and agility, thereby supporting the concept of SOA and IT artifacts lead to fundamental changes in technology and infrastructure of business. The goal of service orientation builds on the properties of the underlying service concept. Loose coupling is one of the important features of SOA which supports the flexibility to change a system comprised of such services. generally service orientation as a design paradigm contributes to flexibility of organizations[8]. The analysis of critical success factors is commonly accepted as a useful approach to cope with complexity in IS research. In order to achieve the goal of article, we try to answer the following questions:
(1) What are the characteristics of successful implementations of the service oriented design? (2) How are the critical success factors influencing, driving and/or determining these characteristics? The remainder of this article is organized as follows. Section 2 is about literature review. Sect 3 explains SOA specifications, in Sect 4 is presented business-IT alignment. Finally, in Sect 5 and 6 we provide a list of factors that are critical in SOA project. In sect 7 we presented a conceptual framework. In the final Section we summarize and conclude the article.

2. Literature Review

The subject of attaining strategic alignment is not new. For over two decades, scholars and practitioners have been faced with the challenge of revealing the secret formula which will provide companies with a competitive edge. However, it soon became obvious that creating a generic solution for any kind of enterprise and for any type of Information System was a mere illusion [9].Although such studies provided some strong information about critical common factors influencing alignment, they could not describe those case special attributes which are responsible for the greatest part. Before diving into case special results, it is first necessary to isolate those common factors that are of critical importance in the search of attaining strategic alignment.

In recent years, much research has been done on this field a large amount of empirical publications exist which provides us with the necessary background to build upon. There is a recognized lack of empirical studies on the business aspects of such implementations in the field of Service orientation[10]. Only a small proportion of SOA-related research has centered on enablers of successful SOA projects from a business point of view with the majority of publications being focused on technical aspects[11, 12]. Our goal is to recognize those elements which lead to increased business performance, as outcome of strategic fit between SOA projects with business strategy. We argue that when an IT project is aligned with business needs, top management perceive the implementation of IS/IT as a success. So, it is our belief that success factors in SOA projects are in essence aspects that result in a strategic fit between business and IT. To achieve these objects, we have selected to review empirical studies with a significant number of respondents to assure a high degree of validity. From these empirical studies, only highly cited or recent work

TABLE I.
ARCHITECTURAL REQUIREMENTS[13]

Challenge	Requirement of Architecture
Loosed coupling	Loose coupling means to minimize dependencies so that the reform was carried out with minimal change or even in failure or malfunction of the system can still continue to work.
Agility	Heterogeneous systems can easily connect to each other with high flexibility.
Discoverability	Services can be combined. This feature is actually kind of service reuse.
Reuse	Ability to manage and maintain during the life cycle of a service provider and consumer needs is important.

published   in distinguished journals and conference proceedings are sel ected.   Finally we have chosen to use empirical studies for our purpose which is found can be applied in organizations in a range of business areas.

3.SOA Specifications

When processes are changing the characteristics of agility helps to change comfortable. The Services can support set a variety of processes at different levels with the least amount of gap and overlap. Services can also follow an enterprise semantic model to share it. To assist these goals,

a set of requirements in service-oriented architecture is as follows:

- A business architecture offers an enterprise roadmap for the processes and services that presents the functional and application capabilities to support those services.
- An information architecture offers a roadmap for the shared data and enterprise semantic model.
- An application architecture that offers a set of different services, How to produce and use the services and how to measure them.
- A technology architecture describes all the things that related to the technologies such as processes, services, information and so on.

Table 1 shows a summary of the requirements for the architecture. Specifically, for a different challenge, there is a lot of overlap between the architectural requirements. As a result, a comprehensive approach to architecture should include a set of solutions to meet the requirements[13].

4. Alignment of business and IT

Alignments of business and information technology in different ways have been proposed. Reich and Benbasat defined alignment As a combination of mission, purpose and application to support of the IT strategy[14]. They claim strategic alignment helps objectives and activities of the organization with an information system are in equilibrium level. They believe that strategic alignment fills the gap between IT strategy and business strategy.

Although there are various definitions for strategic alignment but all of them is a competitive advantage for organizations[15].According to previous research, strategic alignment requires to be shared with high degree of *domain knowledge*. The term refers to active and capable business and IT managers that are involved in key processes.

Also, Reich and Benbasat claimed that, sharing of *domain knowledge* has a significant impact on IS performance, long term alignment and strategically aligned IT [14, 16]. Although there is a close relationship between the elements, each of them can have a significant effect on the level of alignment [17-19].- The third element is related to the information technology department and business is the *planning process*.

Unlike the three elements, *strong leadership* alone can indicate senior management's ability to use the techniques and principles of appropriate management[20].Mature set of skills, leading to different degrees of strategic alignment[21]. According to previous research, develop skills, increase levels of shared domain knowledge between business and IT staff [22].

5. Key factors in SOA implementation

Like many strategic issues, as well as in SOA, there are similar cases in different businesses. The figure1 shows the key elements in implementing effective SOA-based service integration. There are several factors that are required in each elements [23].
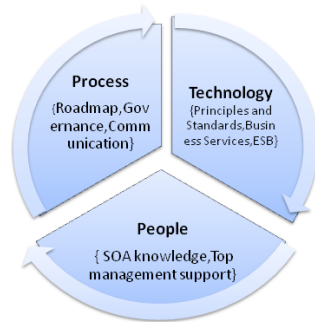
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Figure 1. SOA Elements[23]

5.1 Technology

One of the most important elements of SOA is technology. This concept includes a set of standards, principles and methods. Technology items include [23]:

• Principles and Standards: At the highest level, SOA is a set of principles and standards for business technology that is required to follow them. The following principles were proposed by Yvonne Balzer for implementation and Maintenance of the SOA.
- Interoperability, modularity and reuse.
-Identification and classification of services, monitoring and management.
• Business Services: A business service can be a part or the whole IT services. At first, each enterprise must be defined in a framework and then services should be developed on them.
• Enterprise Service Bus (ESB): ESB is a software architecture model that has been designed and implemented for the interaction and communication between services. Services are linked together with service provider and consumer, by registry. Consumer demand and provider through the registry, provides the desired service.

5.2 People

People, employees, managers and all those involved in the project are influenced on SOA. Some of the aspects are:
• SOA knowledge: Having a set of skills and knowledge at every level of SOA implementation is essential. Lack of adequate knowledge leads to project failure.
• Top management support: Managers as most people can have a great influence on implementing SOA. Since the SOA project is very costly, it is essential in all phases of intellectual and financial manager support.

5.3 Process

There should be a set of processes to support solutions in the SOA. Processes are complex tasks that must be performed. Key process elements are:
• Roadmap: The roadmap has been defined people, processes, objectives, scope and methods in detail. Business and IT team members work in accordance with the road map. Otherwise, the project fails.
• Governance: SOA governance is meaning activities for controlling services in SOA. It defines the processes to govern adoption and implementation of SOA.
• Communication: Communication is important in a different scope of SOA. All things related to management, including resource management, time management, knowledge management, change management, etc should be considered at all level of implementation .Management concepts expressed above are not separate.

6. Success factors for SOA projects

SOA promise flexible composition of elements implementing well defined business tasks to simplify adaptability of software systems, enabling enterprises to cope with rapid changing business needs[24]. In order to stay competitive, organizations need to be agile and quickly adaptable to their environment. The underlying IT infrastructure supporting the business functions must also be able to adjust according to the demands of the business. The basic premise of SOA is that it allows for the construction of loosely coupled composite services from a number of dispersed simple Web Services. It is obvious, that this new architectural style promotes agility in IT, which is in alignment with business requirements. It is evident that SOA projects, which in most conditions span over a number of department and enterprises, need a high degree of Business/IT Alignment in order to be successful [25]. Incredibly, there is an absence of academic investigation for SOA projects on factors that effected on implementation. So, it is not probable to conclude with certainty that the factors found in the limited in quantity studies are the only significantly impacting the attainment of a strategic fit between business and IT. Table 2 prepares an overview on research performed up to date on success factors, for SOA projects.

TABLE2. CRITICAL FACTORS IN SOA PROJECTS

Author (s)	year	Data Extraction method	Sample size	Significant factors
AntiKainen & Pekkola[11]	2009	Interviews	12	•Organizational culture and Human Resources •Process and Methodologies •Communication •technology
Sutawijaya& Chiok[26]	2007	Case Studies	5	•SOA Registry •SOA Governance •Top Management Support •Trust Between Business Units
Boh & Yellin[27]	2009	Case Studies	4	•Top Management Support
Choi & Ramamurthy[28]	2011	Secondary Data	140	•IT Infrastructure
Adbi & Dominic[29]	2011	Case Studies	4	•SOA Governance •Business/IT Communication •Management •Business Processes

It is astonishing that although Service-oriented architecture has been used for a decade, only several research studies have been performed on critical aspects that must be concentrated on during such implementations. Results show that there are a number of resemblances to success factors found in attaining strategic alignment, such as top management support and communication between collaborating parties. This proves that

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SOA projects present some particularities in attaining Business-IT alignment and cannot be treated as traditional IT systems when aiming to attain a competitive edge. In SOA projects, findings from experimental studies reveal that, it must be taken a step further, between business units to collaborate, being necessary in order to realize business objectives. In fact, the culture of the organization helps to align business requirements in a service-oriented architecture project .Other aspects which comprise the organizational culture element are the openness of sharing data and knowledge from the IT side and strategic plans from the business side. So culture of tendency for change is important in order to move to a SOA environment. SOA governance is also presented and regarded as one of the most important aspects that organizations must focus on, since it enables a better fit with business needs. SOA governance can be identified as a subset of IT governance. As an extension of IT governance, SOA governance must address how the decisions rights, infrastructure, policies and measures require to be managed to successfully deploy a SOA project.

7.Conceptual framework

The main idea behind conceptual framework is to merge overlapping concepts from studies on critical aspects in Business-IT Alignment projects and critical factors in SOA implementations. On the basis of a systematic literature review, in order to validate these findings and classify them according to the organizational level which they address, a group of experts were selected to represent their ideas regarding the outcomes via email interviewing. The expert group consisted of six practitioners holding positions such as IT/SOA Consultants, Project Managers, and three academics whose research interests include among others Strategic Alignment and business value of SOA implementations. The relationships between these components are based on our Results in the literature review. Chan & Reich [15] classify the factors, to the distinct organizational levels of alignment: Organizational, System, Project and Individual/Cognitive. By means of a custom-built questionnaire the participants of the expert group were asked to select on what level they believed each factor should be ideally addressed. The results from this survey had very little variation and were mapped by respondents in the following manner with Figure 2 drawing the associations between them in the systematic literature review:

Project: Business/IT Planning Process and SOA Governance

Individual/Cognitive: Skill Development and Strong Leadership

Organizational: Business/IT Communication, Shared Domain Knowledge and Organizational Culture
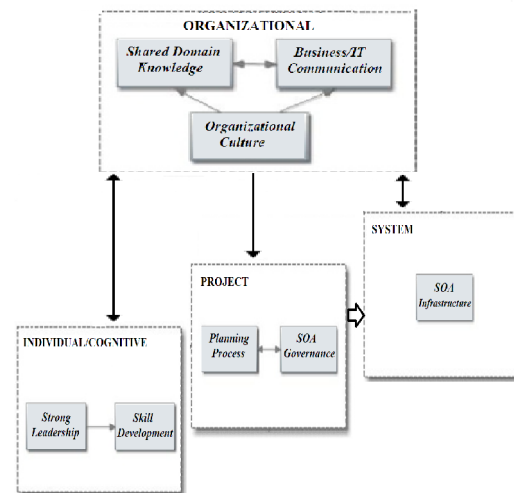
System: SOA Infrastructure

Figure 2. Relationships between factors contributing to strategic alignm ent in SOA projects

By identifying the basic elements and their relationships it is possible to have a vivid image on the cause and effect that actions may have on each of the identified factors. The effect of these set of actions also impacts the level of openness in vision sharing, breaking down business between departments in SOA initiates. In addition to having an effect on explicit knowledge sharing, the increased communication between members of the business and IT domain enables the transfer of tacit knowledge.

Due to the heavy impact which IT has on successfully implementing a business strategy, a new form of structure should be promoted in which business and IT oriented employees closely collaborate on different levels. This view is in contraposition to the isolated business which many organizations chose at project level. Our framework directly pinpoints which areas organizations should focus on in order to realize the expected outcomes of alignment. In fact, in contrast to earlier studies we present an illustrative representation of their relationships based on academic literature.

8.Conclusions & further research

The aim of this research was to identify factors that lead to successful outcomes in SOA projects. In order to accomplish this goal, a meta-study was performed on a number of relevant publications so the most important findings could be outlined. The outcome of this research suggests that when attempting to attain strategic alignment in SOA projects, some additional factors must be addressed. These include *SOA Governance, Organizational Culture* and *SOA Infrastructure* which unlike traditional IT implementation projects contribute to realizing the business objectives set. Since SOA projects aim at fulfilling the ever-changing business needs of an organization, they require a close relationship between business and IT in order to be successful. We further propose by means of a focus group a categorization of these eight factors which are identified into four levels of abstraction: *Organizational, Project, Individual/Cognitive* and *System.* However, this study still remains on a theoretical level without been put to test at large scale. The next step in this research direction is to research each of the found factors in isolation. The same can be done for the different leadership approaches, knowledge management strategies and individual knowledge, skill development methodologies and so on. A further extension of this study would be to investigate how other organizational aspects are affected by strategically aligned SOA projects.

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