

# Service Oriented Architecture and the Roles in an IT Organization

Lauri Eloranta, Ilkka Terho

Helsinki University of Technology  
Software Business and Engineering Institute  
T-86.5165 Seminar on Enterprise Information Systems (2007)

**Abstract.** This report discusses the changing and new roles in an IT organization that is implementing Service Oriented Architecture (SOA). Firstly, the report introduces the basic concepts of SOA. SOA is all about organization and governance: to success in SOA the old roles have to be changed in all levels of an IT organization. The biggest change will happen in the mindset and way of working: SOA requires cross-organizational understanding of business processes and services that implement these processes. Also reuse is the new design principle that should be supported by all the roles in an IT organization that is going for SOA.

**Keywords:** Service oriented architecture (SOA), IT organization, IT governance, project roles.

## 1 Introduction

Service Oriented Architecture (SOA) is very topical paradigm in enterprise architectures and IT systems nowadays. As people are still debating the actual meaning and definition of SOA, more and more companies and IT organizations are at the moment heading for a SOA implementation. It is a real “*we are also doing SOA*”-craze, as companies after companies are putting up their own SOA-solutions.

Although the name Service Oriented Architecture refers to the world of technology and architectures, SOA is actually a lot more than just a new set of tools or technology systems. In a way, SOA can be seen more about organization and people than about technology: in SOA it is the IT organization and governance that matters.

In this report we discuss the question, how the SOA implementation will actually change the roles in a traditional IT organization. Here, we define *a role* as a work role in an organization: a role is a set of work tasks and responsibilities that can be collected under a single job description, such as CIO, developer or architect. It is also worth noting for, that in this report we do not make difference between the roles in an external project organization that is actually implementing SOA for somebody else, and the roles in an internal IT organization. With the notion *IT organization* we refer at the same time to both of these concepts.

Thus, our research problem is: How does Service Oriented Architecture change the roles in an IT organization?

### **1.1 Research Methods**

The research is done based on a literature analysis. Our main sources of information are books, articles and WWW-pages about Service Oriented Architecture and the organization of a SOA project.

Our literature analysis is based on the methodology described by Webster and Watson [16]. We tried to follow the structured approach given in their paper and followed citations backward and forward as Webster and Watson [16] suggested.

We gathered knowledge about the topic in many ways. Originally we tried to use only scientific articles and search those only with Google Scholar. During this process we found out, that the topic is not covered very well in the scientific literature and the results we found with Google Scholar were few. We extended our search to cover also a few basic books about SOA and we also used Google to find more material. We included also trade journals such as CIO Magazine in our sources of information, although we are aware that they have not gone through any scientific validation.

We planned an initial set of key words that was the base for our search. Following citations backward and forward was also a good approach to find more material. The books and WWW-pages recommended by the lecturer were also good and we found some relevant articles there.

### **1.2 Scope of the Report**

There are many possible ways to organize an information technology development in a company. In this paper we scope our research to cover only the roles of a traditional project oriented information system development and how Service Oriented Architecture affects on these roles.

### **1.3 Structure of the Report**

This report consists of five sections:

- In section 1 the research subject is introduced, research method described and scope of the report defined.
- Section 2 is an introduction to Service Oriented architecture (SOA).
- Section 3 discusses the traditional project roles in an IT organization.
- Section 4 discusses how SOA changes the IT organization and its roles.
- Section 5 is reserved for concluding remarks and further discussion.

## **2 Introduction to SOA**

Service Oriented Architecture is an IT buzz word with multiple interpretations but a successful SOA can also deliver real value to business. In this section the basics of SOA are introduced to be able to understand the principles affecting the role division of a SOA project.

### **2.1 Why SOA is needed?**

The emerging need of business agility and flexibility has driven organizations to seek new approaches for information system development. SOA is a new paradigm to organize end-to-end enterprise integration [3]. A successful SOA provides the agility and flexibility of information systems that are needed to fulfill the fast changing business needs [2].

### **2.2 The concept of a service**

Service Oriented Architecture is based on the concept of a service. In SOA world information systems are decomposed into services. Every service should perform a meaningful unit of work from the business point of view. Services are composed to form the enterprise information systems [9].

### **2.3 Benefits of applying SOA**

The main benefit of applying SOA is the possibility to reuse of the services. The loose coupling between services and service consumers enables the enterprise wide use of services [3]. When services are well designed and they execute real business functions they are useful in several business units.

When a company has a comprehensive portfolio of services new business processes based on these services can be implemented quicker than if the development should every time be started from scratch. Modifying the existing business processes is also easier and faster because existing services can be reused and only the composition of the services should be changed [9].

The enterprise departments have traditionally ordered their information systems from the IT department. The same kinds of systems are implemented for multiple departments and the integration of these systems has been the problem of the IT staff. SOA is an enterprise-wide approach. It provides a change for IT and business people from various departments to meet in the middle [2]. Both business and IT people are also integrated into teams when SOA is planned and implemented [11].

### 3 Traditional IT organization, skills and roles

#### 3.1 Organization

A traditional service-based IT organization has evolved more than twenty years and it is common in large and medium sized organizations. All large enterprises have their own internal IT organizations led by Chief Information Officer. Internal IT organizations serve mainly employees and departments within the company providing e.g. application development, maintenance and support services [12].

#### 3.2 Skills

In a traditional IT organization the needed skills depend on the applications that are developed and later maintained. A lot of application specialists are needed in IT department to know both the technical and the functional aspects of the applications. There might be separate staff that takes care of the application development projects and after the implementation phase ends the maintenance is taken care of by different staff [9].

#### 3.3 Roles

There is not a single definition of traditional IT organization roles. There are many aspects which affect the division of the roles e.g. the structure of the organization and whether the development is project or process based. Table 1 lists some IT project roles presented in literature.

**Table 1.** Traditional IT project roles.

Mittal [11]	Bieberstein et al. [2]	Cockburn [4]
Project manager	IT project Manger	Project manager
Business analyst	Business Analyst	Business expert
Architect	Architect	Lead designer
Developer	Developer	Designer/programmer
Security	Security Specialist	
Database support	Database Administrator	
Infrastructure support	System Administrator	
		Project sponsor
		Expert user
		UI expert
		Reuse point
		Tester
		Writer

Our literature study revealed that there are four basic roles that are present in almost all IT projects. The size of the project does not affect so much on these roles because the same person can have multiple roles or a team can take care of a single role [2]. Project manager, Business analyst, Architect and Developer were proposed to be the basic roles of an IT project in all three articles we reviewed to get an idea about the traditional roles. There can also be many other roles depending on the project. As our literature study shows database and infrastructure support can be very important when enterprise software is developed. UI expert is needed e.g. when high level of usability is needed.

## **4 SOA Changes Old Roles and Brings New Roles**

SOA will change many things in an IT Organization. As the fundamental way of building IT systems changes in the form of service oriented architecture, the organizations building these architectures will also change. It is no wonder, that SOA organization and governance is said to be one of the biggest determinants for success in SOA projects [2],[3],[6]. It is up to the IT organization to evolve into the needs of service oriented architecture.

Achieving the right organization structure is one key element of implementing SOA. But it is not all. Also cultural aspects of an organization are important. When organization changes, also the organization's culture changes [2],[3],[10]. According to Schein [13], the organization's culture is the first thing to be altered, when changes in the organization structure is needed. But changing the organization and its culture is nothing but easy [13],[3],[5].

The changes in the structures of an organization that is implementing SOA can be divided in two categories: changes in organizational level structures such as *technical architecture boards* or *review boards* and changes in lower level and more individual structures such as *project level roles* in the IT organization [also 2]. Here we will discuss solely the changes that will happen to the roles in an IT organization.

### **4.1 New Skills and Roles Needed**

SOA changes the work in an IT organization and in the process the roles that operate in these organizations. Before SOA, IT organizations used to be *building* applications. In the new SOA paradigm they are more likely to be "assembling" applications from previously made services [6]. In addition to this shift, the whole SOA environment requires a new set of skills and most importantly new mindset from the implementers: when earlier it was sufficient to understand just specific functionality of an IT system, now even the developers need to understand the cross organizational business aspects of a new application or, preferably, a new service [7].

Many new skills are needed from the participants in a SOA project. For one, software developers will have to be trained some new web service technologies and tools, if

they are not known beforehand. Understanding the underlying technologies and standards such as XML, SOAP, WSDL etc. is important, but as mentioned earlier, the biggest challenge is to change the view of the whole development process: now it is all about larger architectural issues, business issues, business processes, services and most importantly reuse of these services. [7],[2]

In a SOA project there will be many roles that resemble the traditional IT project roles. These include, for example, CIO, project manager, architect, business analyst and developer etc. But in the SOA paradigm, these roles might have a somewhat different meaning in comparison to the traditional ones [2],[3]. Numerous authors also stress, that when a company is implementing SOA many totally new roles are needed [1],[2],[3],[6],[7],[10],[11],[14]. Unfortunately, only a few papers actually name and discuss these roles thoroughly. Instead, many of our sources settle for just giving a few examples such as service librarian or service developer. In the table 2 below we give some new SOA roles mentioned in different sources.

**Table 2.** New SOA project roles.

<b>Bieberstein et al. [2], Zimmermann &amp; Mueller [15]</b>	<b>ZapThink [14]</b>	<b>Haines [7]</b>
SOA Architect	SOA Domain Owner	Service Developer
Service Designer	Domain Business Analyst	Service Librarian
Process Flow Designer	Line of Business Representative	
Service Developer	SOA Domain Developer	
Integration Specialist	Service Tester	
Interoperability Tester		
UDDI Administrator		
UDDI Designer		
Service Governor		

Here we go shortly through the new roles according to Bieberstein et al. and Zimmermann & Mueller [2],[15] to give some insight, what kinds of new project roles may be needed. The more technology specific *UDDI roles* are excluded here for simplicity.

### **SOA Architect**

One of the most important new roles is a SOA architect that will replace the role of a traditional architect. A SOA architect is a mediator between the technology and business worlds of SOA and is responsible for end-to-end service requestor and provider design. In another words SOA architects need to negotiate the whole big picture of a given application between technology and business needs. [2],[15]

**Service Designer**

The job of a service designer is to model services according to data and functionality modeling techniques. They define, for example, service interface contracts and messaging schemas between the services. [2],[15]

**Process Flow Designer**

This is, as the original paper says, an optional role. The process flow designer tries to map a given business process to an explicit and declarative service orchestration. In another words, process flow designer designs the technical side of a business process. [2],[15]

**Service Developer**

Service developer is in charge of the actual development of the services. They develop the service interfaces and implementations on the side of the provider and also the service invocation code on the requestor side. [2],[15]

**Integration Specialist**

Integration Specialists act as a link between the service designer and process flow designer and their work. Integration specialists have to have a broad technical experience in the integration field and understanding of the SOA systems. [2],[15]

**Interoperability Tester**

Interoperability tester ensures the implementations conformance to used standards and that any given service request-respond implementation works correctly. [2],[15]

**Service Governor**

Service governor is a cross-divisional role that validates and selects the right and most suitable business services for a given organization. Service governor also tries to find out who actually owns these services. [2],[15]

As one can conclude from the vague descriptions and table given above, the new roles in a SOA organization are not yet as finalized as they could be: different sources give different new roles to the IT organization. It also seems that new roles are invented when the need for them arises. In this situation it is not quite clear, if all the roles given in different sources are actually needed. In some organizations the role of the service governor, for example, could be handled by service architect instead etc.

On the whole, it is not an easy task to define, what new roles an SOA implementing IT organization will need. Therefore, instead of debating of the defined new roles, it might be more useful to discuss, how do the old roles of the IT organization change.

**4.2 How Will the Roles in an IT Organization Evolve?**

Here we discuss, how the most important and existing roles in IT organization and IT projects will evolve when the organization is moving towards SOA. Many articles that tried to give and define new SOA roles actually concentrated more on the subject

how existing project roles are extended and evolved in SOA paradigm [1],[2],[5],[6],[7],[8],[10],[11],[15]. Also, in many articles the line between old, extended and new roles was not quite clear. Also, with the novel understanding how these existing roles will change, the other, maybe new, roles can more easily be adjusted into the IT organization [also 11]. The roles that we handle are CIO, project manager, architect, developer and business analyst.

### **CIO**

Here we discuss the new role of the CIO in the organization. Although, the CIO is not an actual *work role* of a SOA *project* we decided to handle it none the less. This is because in many of our articles [5],[8],[17] it was the role of the CIO that seemed to face the biggest evolution. These changes are due to the previously stated facts that the success of SOA depends strongly on the IT organization and governance. And who other deals more intimately with these matters than CIO?

According to Graham [5], strong IT governance is the key to success. SOA will be a failure with a CIO that is not embracing strong SOA governance. Firstly, CIO needs to get strongly and personally involved with SOA as early as possible: there is really nothing better for a SOA success than a CIO as a SOA champion. CIOs need to get hands dirty with SOA both at the low and high level SOA decisions. Further, CIO will have to be more concentrated to the role division and organization of their IT departments: it is the job of the CIO now to define and negotiate the new SOA roles. In the process, the SOA CIO must now be master of the change of organizations culture also: they should know how to change the organization effectively. [5]

The role of the CIO changes also on a bigger level. Because SOA brings more and more together the business and technology sides of the IT, also CIO must better comprehend both of these worlds [8],[17]. At the same time CIO has to handle matters ranging from business value, cross-organizational business processes and their implementation, and on the other hand low level application implementation and maintenance. Holmes [8] even suggests that the role of CIO will be therefore divided in two: there would be the strategic CIO handling the business related big picture and then there would be the tactical CIO executing the day to day IT Organization. Worthen [17], on the other hand, sees that this brings the roles of CEO and CIO more closely linked.

### **Project Manager**

The role of the Project Manager in a SOA team is also changing. The biggest change will probably be the fact, that with SOA the development cycles will definitely be shorter in any chosen development process (from agile to waterfall) [11]. So, project manager needs to be able to plan shorter delivery times for services. Project Managers will also have to be able to more and more understand both the business and technical world of SOA paradigm. Their work is integrated with the business users and customers but in the same time with the traditional IT implementation team. Also, when the SOA implementation goes further, the project manager will be gradually more responsible of coordinating and tracking running services instead of implementing new services [11].



### **Architect**

The role of an architect (or SOA architect) is discussed here, although the role of SOA architect was previously defined in the section 4.1. This is because, unlike some authors [2],[15], we think that SOA architect can be fundamentally seen as an evolution of an old role, instead of a totally new role. Although, all the matters said about SOA architect are also valid here.

According to Mittal [11] the role of a SOA architect is also seen as a SOA champion, just like the CIO. Naturally, SOA architects need to be fluent with the SOA concepts. It is important that they really get the big cross-organizational picture of the business processes that are implemented. They also have to make sure, that implemented services are really needed and most importantly reused. They are the key decision makers concerning service management and orchestration.

As said before, an architect in the SOA paradigm is a mediator between the technology and business worlds of SOA and is responsible for end-to-end service requestor and provider design. She makes sure that all implementation is done in the principles of service orientation. Importantly, SOA architect is the person to design the granularity of the services, a totally new concept when moving into the SOA world [2],[11],[15].

### **Developer**

As with the architect role, we see also the service developer or SOA developer role more as an evolution from the original developer, instead of a totally new role.

The developers in the SOA world need to, as said before, really understand both business processes and the implemented functionality. When they build and compose new services, good design principles for error handling, data translation and security etc. are more important than ever. The developers will also have to change their preferences from building to more and more reusing, because in the end, the reuse is one of the biggest things in SOA that changes developers work .[11]

### **Business Analyst**

The role of the business analyst can be seen one of the most crucial in the new SOA team. Traditionally business analysts have been communicating with executives and users at a strategic level to extract their requirements for a given application. With these requirements they have discussed with the technical team to transform them into technical specification. But in the SOA paradigm, business analysts will have definitely more work at their hands. First of all, they now have to work with the whole development team to make them start thinking in the concepts of services. They also have to figure out what services are needed and what services are implemented. In here they work together with the technical team. [11]

It is worth noting for here, that the role changes of traditional business analyst resembles somewhat the new project roles given earlier by Bieberstein et al. and Zimmermann & Mueller [2],[15], namely, service designer, process flow designer and service governor. This illustrates the unclear distinction between the evolution of old

roles and creation of new roles. In our opinion, it might be better to evolve first the old roles, and just then consider what new roles are really needed.

## **5 Concluding Remarks**

It is quite clear, that when a company is implementing Service Oriented Architecture a lot of changes are due to happen. Besides the technology issues, SOA will also require changes into the traditional IT organization. As many authors say [2],[3],[6], these organizational and cultural changes are one of the biggest determinants of SOA success. Get them right and your SOA implementation will flourish also.

Need for organizational and role changes in SOA organizations are evident, although naming and defining the specific changes in a distinct and to be SOA organization specific is hard. How should one change the IT organization then? To be short, there are no right answers. In our literature study we found out, that although some authors put some effort into naming and describing new and changing roles, many did not discuss these matters explicitly at all. In addition, the real scientific articles on the matter are scarce in numbers: in our literature study we did not find a single scientifically credible article that discussed the role changes when implementing SOA. On the one hand this means that this study was only a venture to try to put together the scattered information given in different, not so scientific sources. On the other hand this also means that there is a lot of further research to be done on the subject.

Bottom line here seems to be, that SOA changes the fundamental mindset of implementing IT systems in all levels of the organization. It is now longer sufficient to just understand the technology when broad understanding of business value and business processes is required. In a way, when viewing SOA from the IT roles point of view, it is more like a new ideology and a way of working. It changes the way we design, develop and maintain IT systems. It is not about building systems anymore: it is about reuse of services. It is not about building specific functions: it is about implementing cross-organizational processes. These matters, in the end, can be seen as the biggest changes in the roles of an IT organization that is implementing SOA.

## References

1. Barry, D. K. 2003. Web Services and Service-Oriented Architecture: The Savvy Manager's Guide. Morgan Kaufmann Publishers, San Francisco.
2. Bieberstein, N.; Bose, S.; Fiammante, M.; Jones, K.; Shah R. 2005. Service-Oriented Architecture Compass: Business Value, Planning, and Enterprise Roadmap. IBM Press, Indianapolis.
3. Bieberstein, N.; Bose, S.; Walker, L.; Lynch, A. 2005b. Impact of service-oriented architecture on enterprise systems, organizational structures, and individuals. IBM Systems Journal, Vol. 44, No. 4, 2005.
4. Cockburn, A. 2000. Selecting a project's methodology. IEEE Software, Vol. 17, Issue 4, pp. 64-71.
5. Graham, B. 2006. SOA Organization and Governance Requires CIO Leadership for Success. CIO Magazine, October 09, 2006.
6. Gruman, G. 2006. SOA Success? Focus on Process and Architecture. CIO Magazine, May 01, 2006.
7. Heines, M. N. 2007. The impact of Service-oriented Application Development on Software Development Methodology. Proceedings of the 40th Annual Hawaii International Conference on System Sciences (HICSS'07), 2007.
8. Holmes, A. 2006. State of CIO - The Changin CIO Role. CIO Magazine, January 01, 2006.
9. Krafzig, D.; Banke K.; Slama, D. 2004. Enterprise SOA: Service-Oriented Architecture Best Practices. Prentice Hall PTR.
10. Mathews, C. 2006. SOA Transformation - New Roles, New Processes for SOA. CIO Magazine, October 01, 2006.
11. Mittal, K. 2006. Create the ideal SOA team - Redefining the roles of traditional software development teams. IBM developerWorks, <http://www-128.ibm.com/developerworks/ibm/library/ar-soateam/>, 11.4.2007
12. Patten, K. 2004. HOW CIOs BALANCE FLEXIBILITY AND RELIABILITY IN UNCERTAIN BUSINESS ENVIRONMENTS - International Journal of Computers, Systems and Signals, 2004 - [fullcycles.org](http://fullcycles.org)
13. Schein, E.H. 2005. Organizational Culture and Leadership, 3rd Ed., Jossey-Bass.
14. ZapThink, 2007. Practical SOA for Government. April 26, 2007. <http://www.zapthink.com/report.html?id=ZAPFLASH-10272004>, 8.4.2007.
15. Zimmerman, O.; Mueller, F. 2004. Web Services project roles - The team perspective. <http://www-128.ibm.com/developerworks/webservices/library/ws-roles/>, 1.4.2007.
16. Webster, J.; Watson, R. T. 2002. Analyzing the Past to Prepare for the Future: Writing a Literature Review. MIS Quarterly Vol. 26, Issue 2, June 2002, xiii-xxiii.

17. Worthen, B. 2006. Dow CIO Kepler Talks Up SOA, Alignment, the CIO/CEO Relationship. CIO Magazine, September 01, 2006.