

## SOA and BPM, a Partnership for Successful Organizations

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*In order to stay effective and competitive, companies have to be able to adapt themselves to permanent market requirements, to improve constantly their business process, to act as flexible and proactive economic agents. To achieve these goals, the IT systems within the organization have to be standardized and integrated, in order to provide fast and reliable data access to users both inside and outside the company. A proper system architecture for integrating company's IT assets is a service oriented one. A service-oriented architecture (SOA) is an IT architectural style that allows integration of the company's business as linked, repeatable tasks called services. A subject closely related to SOA is Business Process Management (BPM), an approach that aims to improve business processes. The paper also presents some aspects of this topic, as well as the relationship between SOA and BPM. They complement each other and help companies improve their business performance.*

**Keywords:** Information Systems, SOA, Web Services, BPM

### **1 Introduction. Necessity of system integration.**

Companies are faced with more pressures from the business environment, concerning relationships with their partners, customers and suppliers, as well as new compliance regulations and technology. Regarding information technology, there are many companies that have built information systems in a decentralized manner. Every department used to develop and deploy its own applications, without taking into consideration similar applications built by other departments within the company. Through time, this manner led to many versions of more or less the same application, slightly different from one to another. Thereby, the company's systems became very complicated, inflexible, high resource consumers and expensive to maintain. In such a situation, any change in company's business policy requires the identification and modification of all the applications that are affected. This would take much time and nowadays, under conditions of markets that are more dynamic than ever, time has become a critical resource. In addition, nothing guarantees that all changes are made properly and all applications will remain consistent.

This multitude of systems and applications has become a brake for business process enhancing. They have to be transformed so that they serve the overall business requirements. To this effect, the organization's software applications and business processes have to be linked into an integrated system, which can ensure operational performance and competitive advantages. The various departments need to be able to collaborate easily, to share accurate and reliable data and information, to integrate their systems and applications, in order to offer a better support to the decision making process concerning the overall organization's activity. Moreover, an agile enterprise – especially a customer-oriented one – has to open its system and integrate it, in a secure and efficient mode, with the systems of its customers and suppliers, with positive consequences for cost reduction and revenue growth.

To build such a system, a proper architecture must be designed. The architecture describes the organization of a system, its components and the relationships between them and the relationships to the environment. The Open Group Architecture Forum (TOGAF) provides two definitions for architecture, based on the context:

- (i) *“A formal description of a system, or a detailed plan of the system at component level to guide its implementation.*
- (ii) *The structure of components, their interrelationships, and the principles and guidelines governing their design and evolution over time” [1].*

## **2 Defining SOA. Scope and goals.**

An effective solution for integrating the organization's resources is building a *Service-Oriented Architecture (SOA)*, which connects the existing systems in a dynamic environment. SOA is an evolutionary technology in IT which provides important advantages in information system development, ensuring an increased work productivity and application connectivity. It is a conceptual architecture viewpoint and design approach about business role and scope, a systematic work to integrate existing applications and develop new ones. It represents a software architecture that is business-oriented and integrates the business tasks as a set of interconnected and reusable services, which communicate with one another. In the context of SOA, a *service* is a function performed by an application. A function is coded only once and then reused wherever it is needed. This is a difference from traditional systems, where business functions are hard coded into applications. As it's defined in [2], SOA is *“an architectural style for creating an enterprise IT architecture that exploits the principles of service-orientation to achieve a tighter relationship between the business and the information systems that support the business”*.

In systems that are built in an SOA approach, technology is supporting business decisions, unlike traditional systems where business decisions are determined or constrained by technology [3]. SOA separates organization's functions into distinct units that can be reused and combined according to users' needs. It started as a new way of thinking about organization's problems, taking into account both business and technical realms. It provides a framework to integrate

applications so that their functionality can be accessed as services on a network. Existing applications are divided into a suite of services, and their functionality is implemented in a modular fashion [4]. The idea is that programs and applications used frequently have to be packaged in software units that can be used by other components, independent of the programming language they are developed in or the platform they are running on. Ensuring interoperability between different systems and programming languages is an essential requirement for building a service-oriented architecture. For example, a C# service can be used by an application developed in Java. The main purpose of SOA is to create services that can be used any time by numerous disparate applications. Instead of building new complex applications from first to last, services can be adapted and combined in a rapid, easy and efficient way, so that they can work properly in different situations and contexts. Care should be taken to service granularity, a successful service being one that is reused often and changed seldom. A too small granularity makes difficult to build anything meaningful, and a too large one makes the service to work as a complicated application that can hardly be controlled. That is why SOA can be considered a new stage in the modular or distributed programming, or the event-orientation design. As a result of this approach, the cost of creating new applications is low, as all the software components required already exist and need only to be combined.

SOA refers to the best practices for any technology that requires integration, for reuse, sharing and cross-platform interoperability. As it contributes to solve integration problems and facilitates interoperability and collaboration across the organization, during the last years SOA has been widely adopted in many enterprises. When a change has to be made in the company's business policy, only one service needs to be modified. As this service is used by many applications, their consistency is conserved.

As specified in [5], SOA is “*a standard-based approach to managing services made available by different software packages for reuse and reconfiguration*”. In a larger perspective, it is more than a technology; it refers to system architecture, standards, strategy and data governance. A system architecture is a conceptual model that defines the structure and behavior of a system, its components and the relationships between them. In an enterprise-wide system architecture, SOA uses standards that allow it to be portable and independent from particular vendors and technologies. It is a strategy for building business-focused applications. SOA governance, which is critical to the success of this initiative, is the activity of making applications consistent and aligned with business goals and objectives through a well-structured set of policies, procedures and controls. It provides a means to reduce risk, drive a cultural change and show business value of investments. Implemented properly, SOA provides a powerful set of services that can be leveraged within a business process to add efficiency and accuracy to repeatable functions [6] or tasks, such as opening an account or computing loan interests in a bank, or posting an online order for an airline ticket. Information systems using such an architecture can adapt themselves quickly, easily and efficiently to the business needs that are permanently changing.

A more complex definition was issued by OASIS (Organization for the Advancement of Structured Information Standards), a not-for-profit consortium that drives the development, convergence and adoption of open standards for the global information society. According to this group, SOA is “*a paradigm for organizing and utilizing distributed capabilities that may be under the control of different domains. It provides a uniform means to offer, discover, interact with and use capabilities (as well as the ability to compose new capabilities from existing ones) to produce desired effects consistent with measurable preconditions and expectations*” [7].

### 3 Services, SOA's bricks

The essence of SOA is represented by services. Services correspond to repeatable activities that are performed in order to satisfy specific needs. Services are self-contained and reusable software modules with well-defined interfaces that are independent of the applications and platform on which they run, as well as the context and status of other services [8].

SOA is an enterprise architecture that enables the development of applications that are built by combining loosely coupled and interoperable services. The loosely coupled approach enables changing, updating, or adding functionality within one component of the IT system, without affecting other components. In [9] SOA is defined as “*an architectural approach to system development that builds and delivers reusable and encapsulated business services so that different applications can share them in a loosely coupled and highly interoperable manner*”. The foundation of a service-oriented approach consists of organization's shareable business functions. In such an architecture, business functions can be quickly adapted and rearranged to meet new business requirements, and are implemented as reusable services. Services are independent pieces of functionality that can be discovered on the network. They describe the task they are performing, as well as the way that other services can interact with them. Services interoperate based on a formal definition which is independent of the underlying platform and development technology (Java, .Net etc.). They have standard interfaces, so that can be widely reused across the entire organization. The great ability of reusing these services in different applications is a distinctive feature of a service-oriented architecture. In an SOA environment, organization's information systems are rebuilt as services that provide particular business functions. Services communicate with each other, passing data from one another, as they participate in business processes. This approach removes old systems' redundancy and increases their

connectivity, providing a flexible and agile solution, capable to be adapted quickly according to future business requirements. As services are shared across the organization, the costs of their development, administration and operation are substantially reduced.

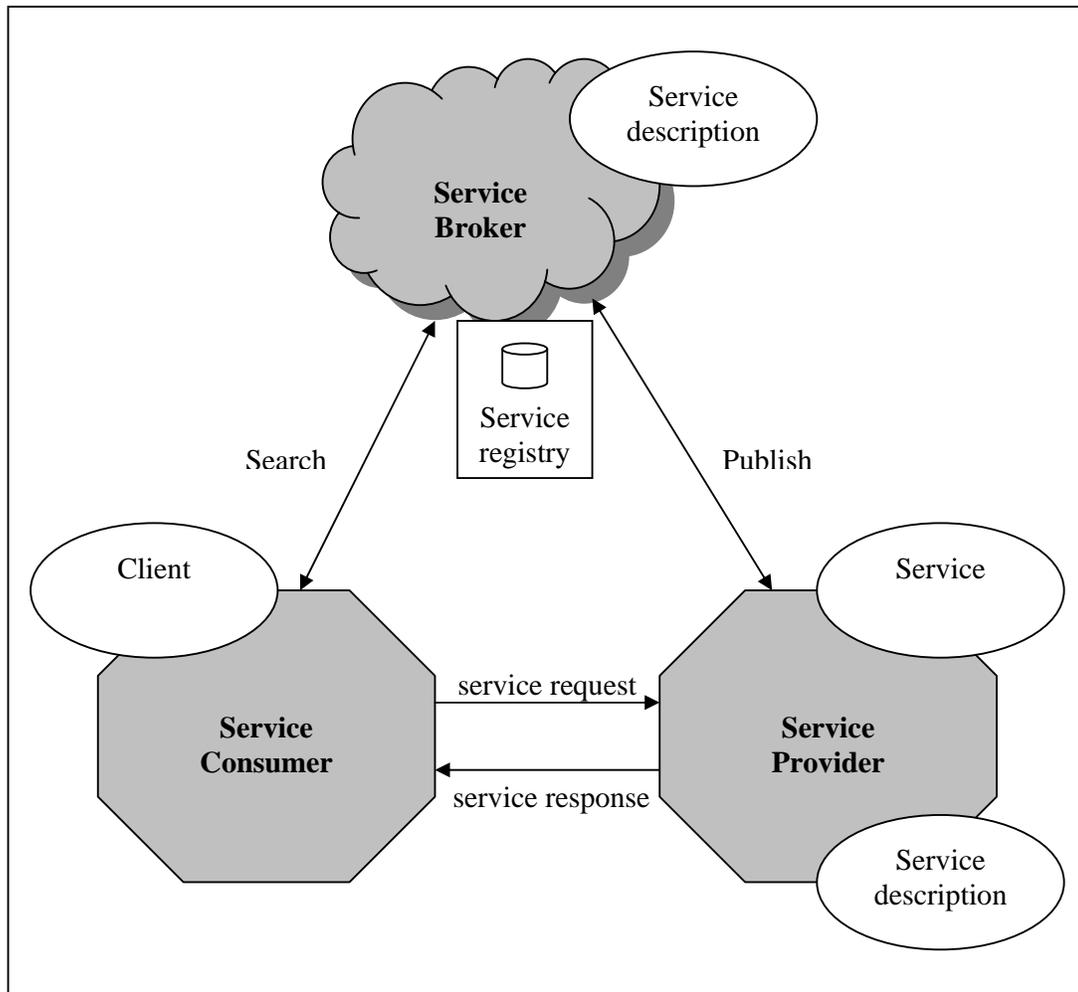
As already mentioned, a service is a repeatable business task done by a service provider to achieve desired results for a service consumer. Both provider and consumer are roles played by software agents on behalf of their owners [10]. Service orientation consists of a composite set of business-aligned services that allow the achievement of flexible and reconfigurable business processes that use special interfaces, based on service descriptors. As Web Wide Web Consortium (W3C) stated, SOA is “*a set of components which can be invoked, and whose interface descriptions can be publish and discovered*”. This type of architecture defines how services interact, so that a service could perform a certain task on behalf of another service. Interactions between services are defined using a description language.

#### **4 SOA architecture**

As mentioned in [3], a service-oriented architecture is “*a software structure for building applications that implements business processes or services, using a set of black-box type software components loosely coupled and orchestrated so that they deliver a well-defined level of services*”. Taking into consideration this definition and the aspects mentioned above, a basic SOA architecture can be represented as shown in figure 1. This

figure explains how a service provider (commonly a remote server) performs a specific task at the request of a service consumer (client).

Services are offered by service providers and are consumed by service consumers. *Service consumers* (or requesters) are organization’s functional processes, while *service providers* are its software applications. They have invocable interfaces that are called to perform business processes. The service consumer sends a service request message to a service provider. For this purpose, using different search operations, it locates entries in the broker registry that contains services’ location and description, and then binds to the service provider in order to invoke one or more of its services. *The service broker* knows the appropriate service provider, as each service provider that is connected to the network publishes its available services. Therefore, it performs the message transfer between a service consumer and a service provider, transforming the message format according the needs of the involved services. The service provider returns a response message to the service consumer, via the service broker too. The request and the subsequent response messages are defined in a way that is understandable to both service consumer and service provider. The messages must be descriptive and comply with a common format, structure and vocabulary (e.g. HTML or XML), otherwise they could not be understood by all parties. At the same time, the messages must be extensible, to be understood not only by the present version of a service, but also by its future versions.



**Fig. 1.** Basic SOA Architecture (adapted from [8])

As already mentioned, SOA integrates the organization's resources. Due to this capability, SOA ensures the mediation, routing and transportation of service requests from a service consumer to the appropriate service provider. The integration layer allows the interaction between the consumer of functionality and its provider. As a result, each service specification is never exposed directly, but through the integration layer, such as an Enterprise Service Bus (ESB). Therefore, this layer decouples service consumers and providers, allowing the integration of disparate applications into a new system. Figure 2 shows the information flow between a service consumer and a service provider that are integrated in an SOA.

The services communicate with each other not through their own code, but through a set of protocols that are developed to ensure the communication between them. These protocols describe the way that services pass data. They are independent of SOA, so that different service consumers can communicate with a service provider in different ways. The management of service interactions is ensured by the service broker layer, that contains the list of all available services and their characteristics. There are two categories of service brokers: public brokers, that are available through the Internet to an unlimited number of users, and private brokers, that can be accessed by a limited audience, such as the users of an enterprise intranet. From another point of

view, service brokers' scope can be larger, covering more activity domains, while others have a smaller scope, limited to only an industry.

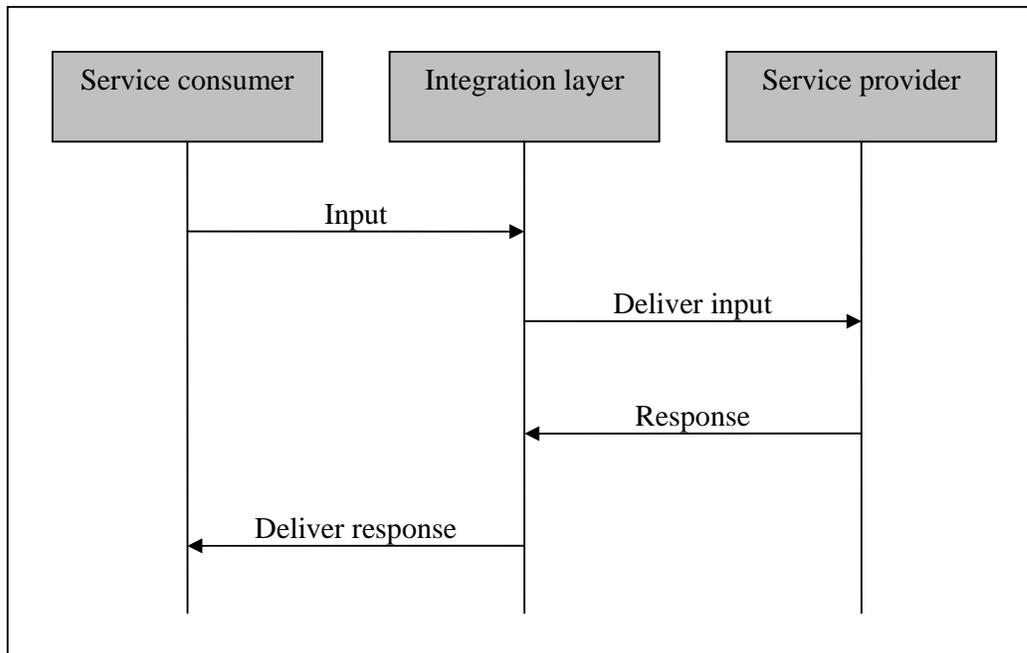


Fig. 2. The information flow in an SOA (source [11])

Although Web services are not a mandatory requirement for developing an SOA, they represent the most common way to implement such an architecture. Figure 3 presents a more detailed example of an enterprise service-oriented architecture. It's a three-tiers architecture that allows systems and applications within the enterprise to use Web services, in order to communicate with each other, as well as with systems of other organizations. Web services enable systems on any platform to communicate and ensure the integration of heterogeneous and disparate applications.

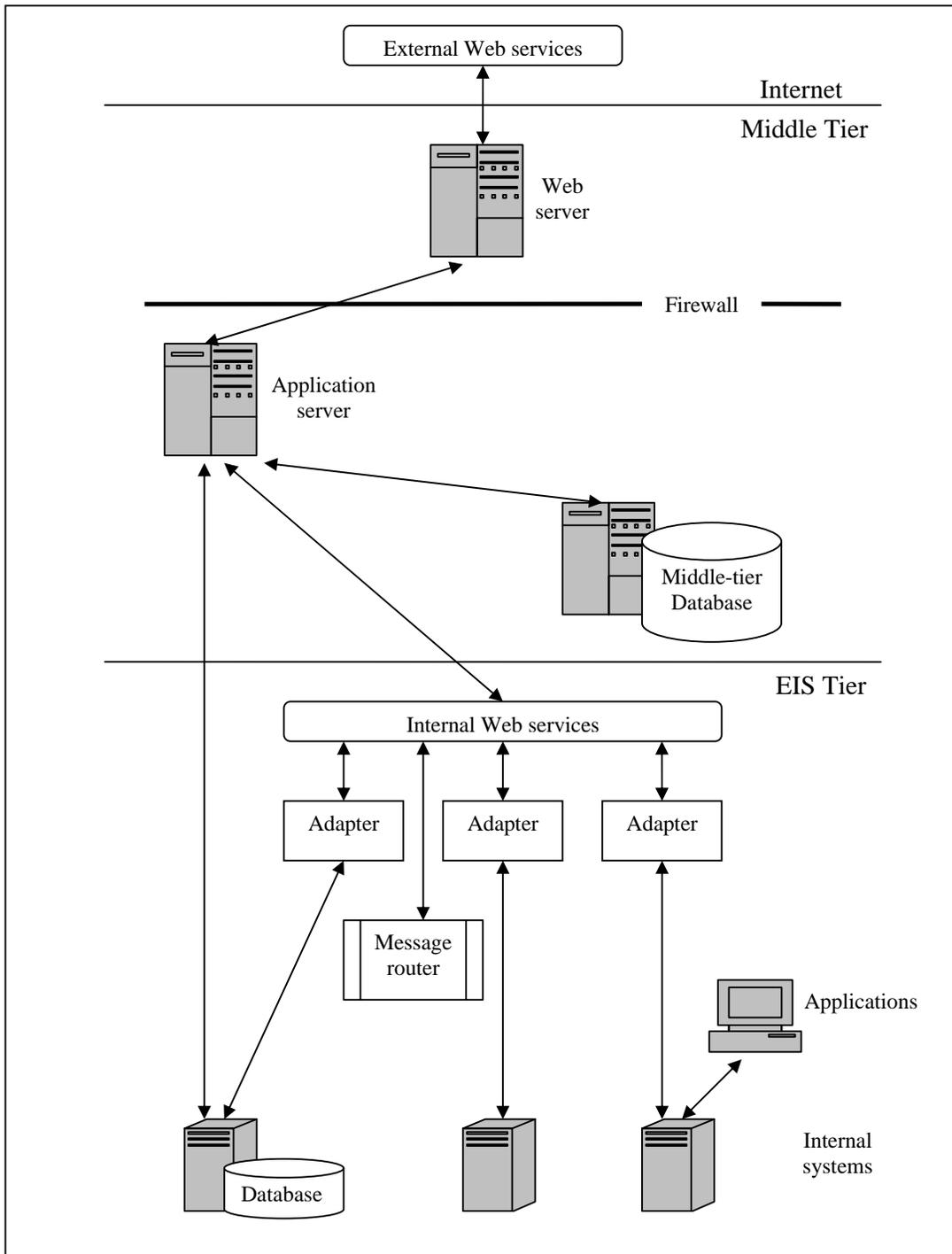
*The bottom tier* is the Enterprise Information System (EIS) tier, where the internal systems and applications are running. Not all systems were developed taking account of Web services access. Such systems use Web services adapters with the aim of connecting them. *Adapters* transform messages of these systems from non-XML format into XML format – a standard for presentation, communication and storage of data – and back to the original format. Data track from a

requesting unit to a responding one and those of the corresponding response is ensured by a *message router*. Also known as application broker or message broker, a router “knows” which of internal systems has to receive a certain message.

*The middle tier* is the layer of application and Web servers. An *application server* should be considered when enterprise's systems and databases have to be integrated in a unique presentation and processing environment. An application server is a software construction that provides an environment where applications run. Usually, it is a Java application server that acts as an extended virtual machine for running applications and handling connections to the database – at one side, and to the Web server – at the other.

A *Web server* refers to the hardware – the computer on which a Web site is hosted, and the software – programs that run on such a computer in order to deliver Web pages that can be accessed through the Internet, as well as associated files like texts, graphics, images, sounds or movies. Its main purpose

is to handle Web pages; that is to say that it receives requests from Web browsers (also known as *clients*) and responds by sending back the appropriate information.



**Fig. 3.** Example of an enterprise service-oriented architecture (adapted from [12])

Data needed to support the processing in the middle-tier is stored in a *middle-tier database*. This repository stores temporary

data, in a consolidated manner, in contrast to an EIS database that stores detailed data.

The upper tier is the Internet layer, where users can remotely access information stored on other computers, all over the world. Through search engines, such as Google or Yahoo!, users can find a vast and diverse amount of online information. Web browsers, such as Internet Explorer, Firefox, Opera, Chrome and so on, allow them to navigate from one Web page to another. The interoperability between computers is ensured through a set of protocols. Protocols are formal rules that describe how data is to be transmitted, especially across a network. The main protocols are IP (Internet Protocol), TCP (Transmission Control Protocol) and UDP (User Datagram Protocol). In addition to these protocols, the Internet protocol system also includes other control and application protocols, such as HTTP (Hypertext Transfer Protocol), HTTPS (Hypertext Transfer Protocol/Secure), FTP (File Transfer Protocol), and so forth.

**Web services** make up the technology that allows service connections. While SOA relates to business vision of integration, Web services represent the IT integration point of view [13]. They are a set of techniques and standards for integration, a method of communication between electronic devices over a network. A service is the end-point of a connection. All combinations of services – both internal and external to an organization – make up a service-oriented architecture. As W3C stated, a Web service is “a software system designed to support interoperable machine-to-machine interaction over a network. It has an interface described in a machine-processable format (specifically WSDL). Other systems interact with the Web service in a manner prescribed by its description using SOAP messages, typically conveyed using HTTP with an XML serialization in conjunction with other Web-related standards” [14].

Standards as Web services enable a truly enterprise-wide SOA to be developed. Applications understand Web services standards, i.e. they can send requests to the appropriate resources and interpret the responses received from them. In this

situation, platform dependencies are removed, the only condition for application communication being that their interfaces remain stable.

## 5 Benefits of SOA

SOA offers some *benefits* to organizations that implement it, both at the level of the IT department and that of business lines. It gives designers and business analysts the ability to quickly replace a service in a process with a better one, without having to write new code. SOA is the main solution that ensures the *interoperability* of systems in heterogeneous environments. Built on open standards, such as Web services, it ensures a greater *flexibility* and *agility*, as it allows business to respond more quickly and cost-effectively to changing market conditions. Capturing many of the best practices of previous types of software architecture, it aims to *reuse* as much as possible programs built as services and ensure a better usage of the organization’s resources. Reusable services can be combined, in a *faster and cost-effective* manner, into composite applications, adding new capabilities as new business needs arise. Reusing organization’s applications *reduces redundancy* and leads to a greater *efficiency* of IT investments, *cost savings* and an increased *productivity*. SOA provides a great overall *security*. As services are independent of one another, the deployment of a new service does not affect the existing ones. Moreover, since services are independent of the platform they are running on, the adopted solution provides a great *flexibility*. Through a judicious interconnection of existing IT assets (systems, applications, data), it ensures the *integration* of internal applications, various technologies, as well as the integration with partners and customers. Therefore, SOA can provide a significant *return on investment* (ROI) by maximizing the value of existing investments and minimizing risk. At the same time, SOA *aligns* more directly IT resources with business goals, helping the organization build stronger *connections* with customers and suppliers, providing more

accurate and comprehensive business intelligence with which to make *better decisions*, and helping information sharing for enhanced *productivity*.

When services are designed, there is no need to know who their consumers will be. They are built as autonomous, stateless units that encapsulate business logic and have fully documented interfaces. SOA separates service consumers from service implementations. Therefore, services can run on various platforms and be accessed across the entire network.

### 6 Business Process Management

Due to the globalization of the world economy and the increasing competition in open markets, companies are obliged to evaluate their performance from the customers' point of view. They must implement technological solutions able to respond quickly to changing market dynamics and pressures. One of these solutions is *Business Process Management (BPM)*, that is considered to be a right answer to these needs, because it deals with a set of management principles that help companies sustain competitive advantages. BPM enables organizations to design, monitor and control their processes. Processes are executed according to well-defined specifications and rules, fact that allows their automation. Process automation improves the performance of business activities, as they can be executed faster, with less costs and with better results, providing a higher quality of services to organization's customers. More and more companies are adopting BPM, because it ensure the optimization and automation of processes to increase the efficiency, a greater flexibility, the reduction of risks and a better consistency throughout the organization by having a single view of it.

BPM is an important topic related to SOA that allows organizations to control changes of their business conditions in a dynamic, timely, reliable and high quality manner. It provides a deep understanding of processes that, in turn, can establish what applications

have to be re-engineered into SOA services. BPM refers to the newest process management discipline in which business processes are viewed as assets to be managed, designed and continuously improved to enhance business agility and operational performance [15]. The main goal of BPM is to ensure the full integration between business and IT requirements. It aims to improve the efficiency through a systematic management of business processes. These processes must be integrated, automated, optimized, monitored and documented, thus becoming an effective support for the decision making process. In [16] BPM is defined as "*all efforts in an organization to analyze and continually improve fundamental activities such as manufacturing, marketing, communications and other major elements of company's operations*". The two initiatives focus on different things: while SOA aims to create a more flexible architecture, BPM focuses on optimizing the organization's activity. But together, BPM and SOA complement each other, offering reciprocal benefits and helping organizations improve their business. Although BPM can be delivered separately from SOA solutions, the automation of business processes and their management can be achieved faster and easier in a system built in a service oriented manner. Organizations have to adapt, optimize and integrate their business processes that are considered to be strategic assets. Processes are executed in a way that is consistent with specifications and rules, so that BPM systems lead to an increasing standardization [17]. The purpose of BPM is to improve the efficiency through a systematic management of business processes that allows aligning organization's strategy and structure with the competitive environment. A *business process* is a collection of structured and measurable activities performed by a group of participants having a common business goal, activities that transform a set of inputs into an output having a certain value for its users. As stated in [16], it is "*a complete, dynamically coordinated set of activities or*

*logically related tasks that must be performed to deliver value to customers or to fulfill other strategic goals*". Business processes are considered assets that can be designed, managed and improved to enhance business agility and performance. Such processes must be integrated, automated, optimized, monitored and documented in a support platform for the management of decision making processes.

Initially, BPM was focused on the automation of business processes through information technology. It has evolved to "*a comprehensive solution that models, monitors, simulates and redesigns processes for competitive improvement*" [18]. Now it is a cross-discipline subject involving knowledge from organization management, computer science, mathematics, linguistics, semiotics and philosophy. As shown in [19], it combines software capabilities and business expertise to accelerate process improvement and facilitate business innovation. To this end, it combines a process-centric and cross-functional approach in order to improve the way in which organizations act for achieving their goals. BPM provides a framework about understanding, building, managing and evaluating business processes, promotes organizational agility and supports users' efforts to drive process changes and rapid innovation. As such, BPM is considered to be a bridge between IT and business, because it helps the alignment of IT and business activities, both within the organization and with its business partners, customers and suppliers. That is why BPM has become an appreciated approach for the design of organizational and information systems in innovative companies. This thing is confirmed by an empirical study conducted by Kohlbacher, that shows that "*BPM helps organizations to gain higher customer satisfaction, product quality, delivery speed and time-to-market speed*" [20].

BPM is a broad framework of methods, policies, metrics, management practices, techniques and technologies that support organizational changes, value optimization

and ongoing performance improvement. It is a structured approach that models the interaction between an enterprise's human and machine tasks, a strategy for managing and optimizing the business performance. In [21] BPM is defined as "*supporting business processes using methods, techniques and software to design, enact, control and analyze operational processes involving humans, organizations, applications, documents and other sources of information*". A business process definition, emphasizing participants' role and their collaborative nature, states that BPM consists of "*a series or network of value-added activities, performed by their relevant roles or collaborators, to purposefully achieve the common business goal*" [22].

### **7 SOA and BPM partnership**

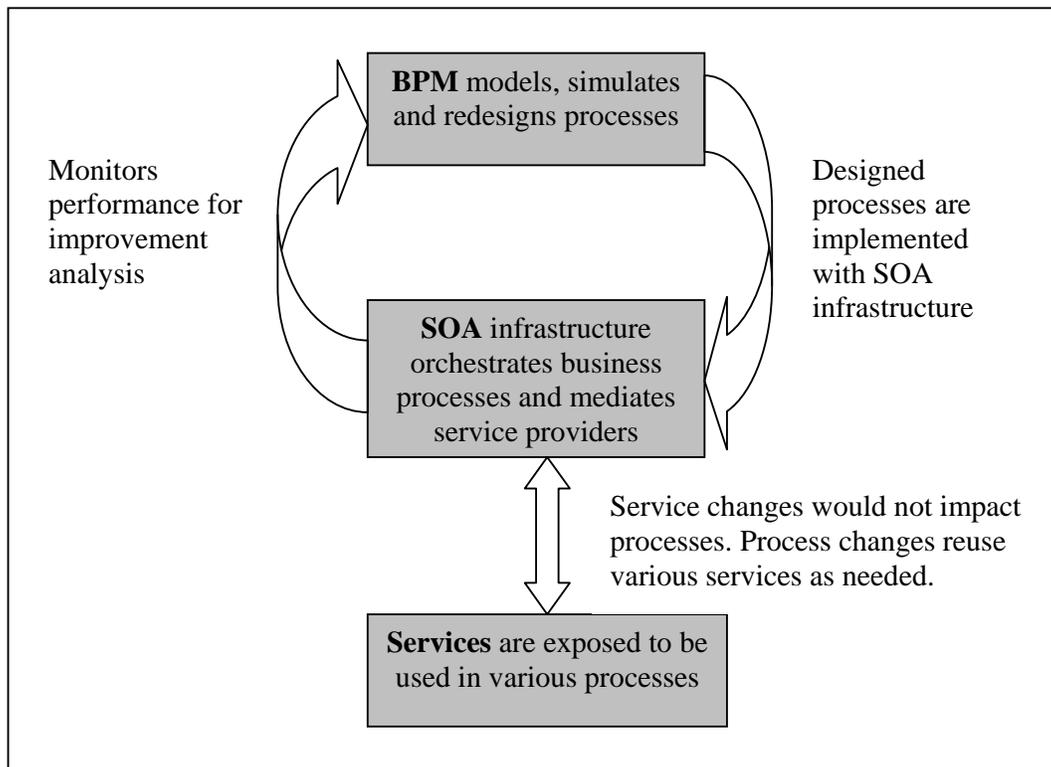
SOA and BPM are different initiatives. SOA focuses on creating a more flexible architecture, while BPM focuses on optimizing the way actual tasks are performed. BPM is a natural complement to SOA and a mechanism through which an organization can apply SOA to high-value business challenges [23]. Although they can be implemented separately, together the two approaches can offer reciprocal benefits.

BPM, that can be described as a "*process optimization process*", leads to an operational workflow improvement, saving time and costs by governing enterprise's processes, both human and automated. It transmits information and decisions between departments and the organization's management. The importance of fast decision making and automation of business processes have become imperative requirements for today's companies. At the same time, after creating or refining a business process, it is necessary to find one or more appropriate services in order to support it. Although BPM and SOA have value on their own, together they ensure business and IT agility, optimization and alignment, with important benefits to both initiatives. A natural synergy exists between them. Together they are more successful, providing greater advantages for

the organizations implementing them, transforming them from reactive into proactive ones. Unlike reactive organizations that rely heavily on reports about what happened, proactive organizations can anticipate what will happen and are prepared for any change of business circumstances. This behavior enables them to take advantage of business opportunities and protect themselves from threats that may occur. BPM can identify and prioritize which services should be built up as SOA first. Together, BPM and SOA deliver *“more value than either would alone, because business priorities are better aligned with IT capabilities and priorities”* [24]. When combined, they enable organizations to become more agile, optimizing their activities through flexible business processes

and IT systems and applications. Moreover, the advantages of such an architecture can be extended outside the company’s boundaries, across the entire value chain.

As already mentioned, the primary goal of SOA is to provide applications as loosely coupled services running into an integrated environment, so that a change of any service does not affect the other services. Similarly, a business process modification should not affect the services involved in its execution. The separation of the logic of processes and services increases the components’ cohesion and the tolerance to change at the system level. As shown in figure 4, this independence between services and processes ensures that any new process may be implemented faster in the organization’s SOA infrastructure.



**Fig. 4.** Relationship between SOA and BPM (source [18])

BPM helps understanding what applications should be re-engineered into SOA services. On the other hand, SOA allows a faster and easier creation and deployment of new composite applications. BPM reduces the

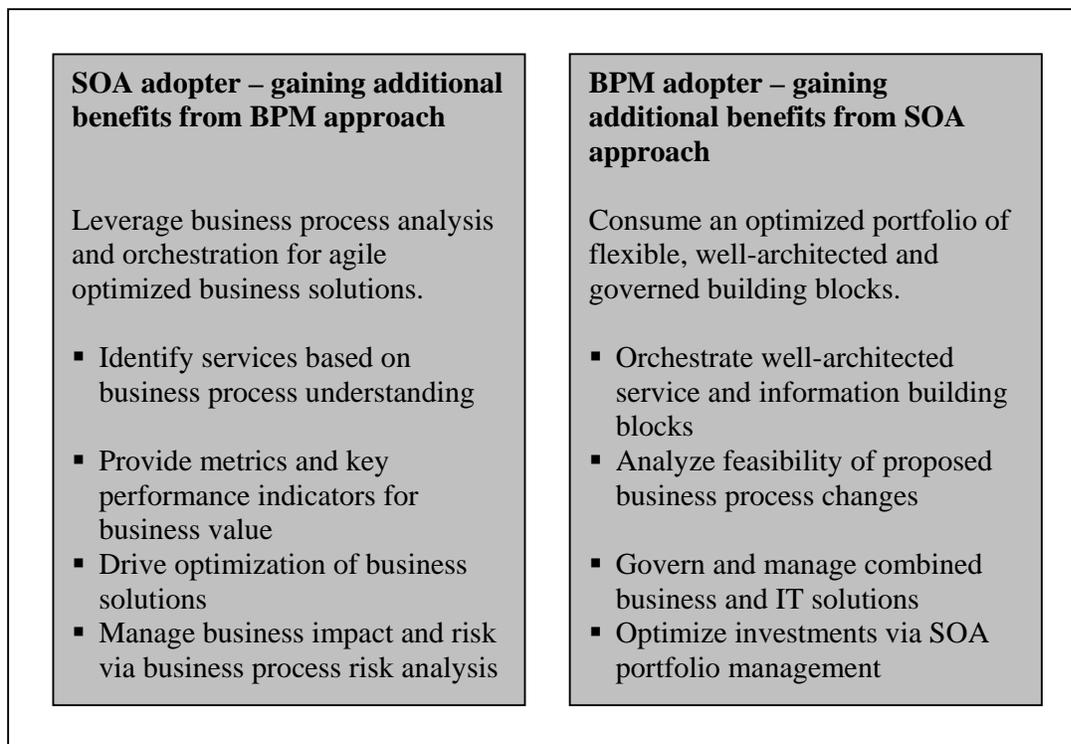
dependence of companies on their traditional territorial and functional structure. It allows companies to adapt their business processes to permanent changing circumstances. Such

rapid changes are possible only into a system built in a service-oriented manner.

The two initiatives have to be deployed on a single platform, where applications are delivered as a set of services that are configurable for process variations. This approach ensures that business analysts can focus only on the business processes, without needing to concern themselves with the technical aspects. When a process requires a service, they just have to select the proper service, as well as the inputs and outputs between the process and service. At the same time, any change of a service made by IT developers would not affect the existing processes that use that service.

BPM and SOA can help organizations respond quickly to changes in the

marketplace, exploit business opportunities and introduce new products and business innovations. To that effect, they need to rely on a robust and scalable infrastructure, capable of providing solutions that ensure the integrity of information, processes and tasks that serve the core of business processes [25]. As already mentioned, SOA and BPM ensure a better agility for organizations that implement them together. As a result, they are able to maintain business performance and integrity in a more dynamic and global environment. As stated in [26], the balance of agility, performance and integrity is exactly where SOA and BPM are strong when implemented together, as shown in figure 5, which emphasizes additional benefits provided by the two initiatives.



**Fig. 5.** The balance of agility, performance and integrity with SOA and BPM (source [26])

There are particular differences between BPM and SOA. BPM is a process-oriented management discipline supported by IT, while SOA is an architectural paradigm. Both have the purpose of gaining a greater agility for organizations that have adopted them but, according to Gartner, they achieve this goal

in a different manner: BPM organizes people, while SOA organizes technology [24]. BPM and SOA can be deployed independently from each other. However, because business processes are frequently changed, BPM as a stand-alone solution is not enough to conserve the enterprise's

agility. As a matter of fact, agility is missing in BPM, because applications built in such a framework are too tight coupled to ensure enough flexibility. It is SOA the solution providing a flexible architecture that implements BPM processes as loosely coupled services and BPM tools as service-oriented composite applications. Reusable services reduce the time and costs associated with system integration. They are developed in order to respond to the dynamic requirements of business processes. SOA enables IT to clearly identify and govern how business processes interact with the underlying systems and ensure that BPM stays focused on business processes. Similarly, only SOA without BPM is not a valuable solution, because it doesn't ensure an adequate agility for business processes. A successful implementation requires a strong harmony between BPM, which is a business-driven activity, and SOA, which is an IT driven activity. Another significant difference between the two initiatives consists in their approach: while BPM is a top-down approach that allows aligning business capabilities, SOA is a bottom-up one, enabling building loose coupling services that can be spread across the entire IT infrastructure and composed to deliver the desired functionality. Their implementation must be achieved in an iterative manner, according to the principle "*think big, start small*". It is necessary to identify a few business processes (3 – 5) with the greatest impact on immediate organization results, processes that will make a difference and will be noticed by users, and then, the services that are consumed by these processes. These services must be developed or re-engineered according to business needs, ensuring BPM and SOA integration. Such an approach allows developing team to accumulate experience and knowledge. The success of the prototype will allow the further development of the project. Thereby, a wider agile and flexible platform will be offered in every iteration.

When BPM is deployed using SOA techniques, services can be combined in

various applications that can support the requirements of any business process, no matter how complex it is. Used in combination, BPM and SOA provide important benefits for organizations that have implemented them. These organizations are able to achieve better execution, greater reuse of standardized business services and provide better control over business processes than if they would develop these projects as stand-alone solutions. Together, the two initiatives contribute to an increased collaboration between various departments within the organization. They reduce organization's costs for development, operating and maintenance and speed up the creation and modification of business processes, helping organizations become more efficient. The greatest decrease of costs takes place in the IT department, because applications move from the design-compile-run paradigm of traditional software development to the assemble-configure-monitor paradigm.

## 8 Conclusions

In today's society, based on information, communication and knowledge, organizations have to be proactive, capable to adapt themselves and react quickly to challenging problems of a more and more dynamic business environment. In order to stay competitive, they need agility and have to be able to respond fast and efficiently to market threats and opportunities. The ability and speed of reaction can make the difference between gaining and losing market share and depend largely on the organization's information systems. Traditional information systems were developed in a static, monolithic and centralized architecture. As business requirements increased, their rigid infrastructure has created many difficulties in the way of integrating disparate and heterogeneous applications.

Executives and analyst need to have a consolidated view of data and information stored in various databases and applications. To achieve this goal, it is necessary to find a solution able to integrate existing systems

and processes of the company. SOA and BPM have proved that, if used together, can provide lower overall costs, more effectiveness, agility and flexibility, helping the company gain advantages over its competitors and improve its position in the market. Studies have shown that SOA and BPM together provide more benefits than if they are implemented separately.

A service-oriented architecture (SOA) is a collection of independent IT components, called services, that are able to communicate with each other in a network. SOA is a flexible and standardized architecture that leads to a better connection of different applications and facilitates the change of information between them. SOA unifies business processes, splitting the old software applications in a set of smaller modules named services. This collection of services operates as a system, interacting with each other in order to accomplish a certain task, and services can be used by users both inside and outside the organization. Since they are built as standalone and loosely coupled units, services can be combined into dynamic applications according to the changing needs of the organization.

In a service-oriented architecture, business and IT work together. SOA proved its capability to enhance the relationship between business and IT and to align their demands, in a way that makes both more effective. SOA is an architectural approach that ensures a high flexibility and reuse of organization's IT assets. Units of programs and applications are packed as reusable services that can be dynamically composed into business processes in order to respond to particular functions.

SOA is not a product, solution or technology, but an approach to design, build, deploy and manage software components. It is a flexible set of principles used to develop and integrate IT systems into a Web-based environment. Thereby, organization's functionality is packaged as a set of interoperable services that can be used within multiple, separate systems. As mentioned in [23], SOA is "*an architectural style that is*

*modular, distributable, sharable and loosely coupled*". Due to these features, SOA minimizes the effects of application changes, providing a faster implementation and lower costs. Using open standards – especially Web services standards as SOAP (Simple Object Access Protocol), CORBA (Common Object Request Broker Architecture) or REST (Representational State Transfer) – SOA has become the main approach for dealing with the interoperability of systems in heterogeneous environments and making business processes more flexible, cooperative and efficient. It is the way of reusing the applications that are running within an organization in a flexible way that provides efficiency, cost savings and a greater productivity. Such a solution responds to the present business requirements and, at the same time, it supports the organization's future development.

BPM enables business to respond to changing demands of customers, market and legislation faster than competitors, providing competitive advantages. It focuses on the relationships between business processes, on integrating human-driven processes with the use of technology, in order to provide advanced analysis and reporting. It is also related to other IT topics, such as integration with existing systems and leverage of emerging service oriented architecture. Implementing both SOA and BPM solutions, organizations become more efficient, effective and capable to adapt themselves quickly and easily to continuous market changes. Due to these features, they gain competitive advantages over competitors.

Resuming this paper, it can be stated that BPM has an increased capacity to improve the organization's business performance, and SOA is the best practice approach to develop a BPM solution. Implemented together, the two initiatives provide a new proactive management culture, which leads to real business innovation and transformation.

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