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Investigation of Service Identification Methods into Service-oriented Modeling Phase

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ABSTRACT

Recent changes in client and business requirements are major challenge for development of large-scale systems. There are different methods to deal with that problem as one of them is service-oriented architecture. Service-oriented architecture comprises various methodologies and life cycles that the first phase is focused on service modeling in all of them. The phase is consisted of three steps including service identification, service specification, service realization. Among these steps, service identification should be placed particular importance due to priority for the application. The reason is that the output of other steps depends on the output of service identification. The given methods are categorized into three parts including prescriptive, semi- automated and automated parts in terms of automation. On the other hand, the existing semi-automated and automated methods are encountered by some problems such as regression performance. We will discuss the existing methods of service identification and its weakness and strength in order to identify services.
Key words: Service-oriented architecture, Service identification step, Service-oriented modeling.

I.INTRODUCTION

Zachman Framework which is considered as “Mandelief table” in enterprise architecture involves a two-dimensional structure in which six aspects including data, process, place,people, time and motivation are taken in to account based on five viewpoints such as a planner, an owner of an enterprise, a designer, a manufacturer and a contractor. The importance of Zachman Framework can be recognized fully when we observe that most architectural enterprise frameworks which have been introduced since 1993, the year of ZachmanFramework invention, are based on this framework and have used many concepts that were first applied toZachman Framework. Accordingly, ZachmanFramework, as a mother of architectural frame work, plays significant role in research papers and articles [4]. John Zachmanhas brought about tremendous changes in issues related to enterprise architecture when he introduced his proposed framework with its expansion in 1993; however, he remained silent about methodology. This framework with its all unique benefits is faced with two major challenges. First, it lacks a modeling language to cover cells within framework, and second it suffers from lack of methodology to formulate enterprise architecture. The first problem has been taken care of in some research literature and university papers [4] and some solutions have been provided. Although they didn’t appear to be ideal and complete, they were acceptable. For the second challenge, it should be noted that there hasn’t been offered a comprehensive and complete solution yet. In view of the fact that there are different definitions of relevant information on service-oriented environment in various references, here just related concepts of service-oriented and its common terminologies are introduced and also the given methods for the service identification are discussed.

II. Services

Within large-scale domain of software at organizational level, the use of abstraction between class and object can lead to increasing complexity due to broad scope of software. As a result, we use the term service as a tool to increase abstraction resulting in decreasing complexity. That is, services introduce high level of abstraction as compared to objects.

1.Business services

The concept of business services is used to describe a specific set of activities that are carried out by an enterprise. Thus, to identify business services, a set of activities done by an enterprise can be investigated and divided into several categories. Each of which is called business service.

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2.Saftware services

The concept of software service is used to describe part of an application[8] which is distinctly applied to different entities. That is, software services are consisted of a service contract[9], at least a service interface [10]and implementation of data as well as the logic of the enterprise. Service contract refers to service responsibility, its operations and internal and external messages for each of these operations as well as the rules and regulations of service use. Service interface determines summonable actions of service for its users. Therefore, logic of business and its data are presented to its users through service interface [2]. When compared business service to software service, the main idea of business and software services are identical to each other. In both concepts, the logic of enterprise is divided into smaller parts anda kind of contract is used to determine the features of service that is accessible to its users [2].

3. Comparison between business and software services

The main idea of the concepts related to business and software services issimilar. Both categorize the logic of the enterprise into smaller parts and use a kind of contract to determine the features of service that are being used by its users, but there are still some differences between them as follows:

1-Business services posses a larger size.

2-The link between business services is more complicated.

3-Software services draw attention to detailed implementation in comparison with business services.

III. Service-oriented architecture

There have been different definitions for service –oriented architecture in references as each of which has devoted attention to specific angle of this concept. These definitions can be divided into two categories including academic and commercial definitions. Some of academic definitions are as follows:

1-From IBM point of view [3,4]: Service –oriented architecture is an approach used to develop distributed systems that provide architectural software application in a service frame work. This approach is ideal to unite technologies for an environment in which different kinds of soft/hard ware are present.

2-Oracle point of view [3]: Service – oriented architecture is a set of self-contained [11]services which can be connected to each other and their main properties are as follows: 1) loose link 2)coarse-grained 3) direction towards the bus[12] 4) service definition at business level which is the result of processes causing flexibility and dynamics of Information Technology to support business point of view.

IV.Service –oriented modeling and Service identification step

Expected services are determined to response to the business requirements[13] in this phase, and their main properties are then identified. The primary purpose of service modeling is to raise the abstraction level and decline complexity when services are applied. This phase is the same as service-oriented analysis and design phases. Thus, the aims of this phase are as follows: understanding the enterprise requirements, identifying the necessary services to cover these requirements and designing identified services.

The first step of service modeling is service modeling phase. This step is of primary importance as the key aspects of its importance can be summarized below [5]: 1- the dependency of the next stepson the output of this step, 2-necessary cost and time to correct errors, 3- to facilitate the process of maintenance. The above division is the most basic inputs of service identification step to enterprise models. Also, services to which the enterprise can accessin any way are considered as an input (arrival) into this step [1]. Data of these services generally store in warehouse of enterprise services. It must be noted that enterprises in which the first experience of service-oriented architecture is carried outdon't naturallyrequire these inputs. Consequently, services are produced and will be stored in warehouse inorder to be used in future service – oriented projects after other phases have been done [1].

V.Enterprise models

To present modeling of different aspects of enterprises, various models have been introduced in such a way that each can be applied specifically based on its nature. As previously mentioned, to identify required enterprise services, enterprise models are used. Accordingly, to select a model among present enterprise models, as a crucial input to service identification step, is of paramount importance. Different enterprise models are used in varied methods for service identification. Since the nature of these models is different from each other, services that are identified with them are also different.Similarly, the selection of proper model can significantly affect the quality of

the final services [1]. Enterprise business process model[14], enterprise business entity model[15] and business application models[16] are some of those models.

VI.METHOD STUDY

Different methods have been presented to implement service identification step that each of which enjoys some advantages and disadvantages based on their noteworthy purposes and criteria. These methods can be grouped into different classes according to their similarities. This can help to study them comprehensively. There have been various groups for service identification methods in different references. In the present paper, the methods are divided into two general groups including prescriptive[17] and automated and semi-automated methods[18]. By prescriptive methods, we mean methods contained a set of instructions to identify services and these instructions are carried out by software architecture and business analyzer with hand. Automated and semi- automated methods are methods done by software architecture and business analyzer. These methods are methods that can identify business and software services with the certain algorithms based on enterprise business models. To better analyze the given methods, we will compare them with the purpose of this research. As previously stated, this paper aims to provide methods for service identification that can become reality through expected qualitative features of services. In addition to the above methods (automated and qualitative assessment of services), other criteria(units of measurement) can be used to study and analyze the methods.

1.Method study

The present author has tried to study and analyze the whole methods presented to implement service identification step in this research paper. Table 1 shows the results of these method evaluations. Reliable values are given in the columns of table 1:

1-Automation: prescriptive methods(-), semi-automated methods (+) and fully automated methods (++).

2-Qualitative service assessment: if the method contains instruction and/or algorithms to assess quality, it will be given (+). If the method is not consisted of instruction and/or algorithms to assess quality, it will be assigned (-).

3-Type of services: (S) will stand for the method if it identifies software services, (B) will be given to the methods if it identifies business services, and finally if the method identifies any type of software and business services, it will be called (BS).

4-Identification strategy: top-down strategy is called (T), bottom-up strategy is (B) and middle strategy is called (M).

5- Documentation(evidence): if all documentation is present, it will be given (++). In the case that only the implementation of samples is proved, or if the documentation is not available and/or a small number of examples are provided, the method will be given (+). On the condition that no sample is presented to evaluate the method,(-) will be the right point.

6-The support of tools: in the event that an independent tool is used to implement the method, the score will be (++). When the existing tools are used to run the method, put (+) in front of it, and finally if there is no support of tool, the best score will be (-).

Note: putting a question mark (?) in the table means that no adequate information about the related issue has been found during research process.

We have investigated 26 cases of existing methods that have been presented to identify services so far. Note that these methods are methods that have been studied during research step of this paper and it is possible that other methods have been used to identify service step that have not been mentioned in table 1. As an example, additional methods were introduced in the service identification field such as [5,6,7,8, 9] which were not mentioned in table 1 due to lack of adequate information. As you see, most of these methods are grouped into prescriptive methods and only one method which was used to implement service identification step was fully automated. We proceed to analyze and estimate the above methods based on introduced criteria.

2.Analysis of studied methods: As previously mentioned, among all studied methods, there is only one automated method. Moreover, among 25 remaining methods, only three of them are classified under semi-automated methods and the rest belongs to prescriptive method. Due to the fact that service-oriented architecture is used to develop large-scale systems mainly, the application of prescriptive methods for modeling and service identification is ineffective leading to human errors due to the expanded scope of these systems. In fact, there are some limitations to automate these methods as well. As an example, in fully automated methods, top-down strategy is mainly used to identify services resulting in ignorance about the enterprise assets and in increase in the cost of system development.

Table1- service identification methods

Rank	Method name	automation	Qualitative service assessment	Type of service	Identification strategy	Documentation	Tool
1.	SOAD	-	+	T	S	+	-
2.	SOMA	-	+	M	S	+	-
3.	Amsden	+	+	T	S	-	-
4.	Inganti	-	+	M	BS	-	-
5.	Zhang	-	-	T	B	+	+
6.	Portier	-	+	M	B	+	-
7.	MOGA-WSI	?	+	T	B	+	+
8.	Stronider	++	+	T	BS	+	+
9.	ASIM	++	+	T	BS	+	++
10.	OASIS	-	+	T	BS	-	-
11.	SAP	-	+	M	S	+	-
12.	Papazoglou	?	+	M	S	+	-
13.	Ivanov	-	+	T	S	-	-
14.	Chen	-	+	B	S	-	-
15.	Kaabi	-	+	M	BS	-	-
16.	Stojanovic	-	-	M	S	-	-
17.	Winkler	-	+	T	S	+	-
18.	Erl	-	++	M	S	+	-
19.	Klose	-	+	M	S	+	-
20.	Kohlborn	-	++	M	BS	+	-
21.	Gold-berstien	-	+	M	S	-	-
22.	Marks	-	+	M	S	-	-
23.	Sun	++	++	M	S	-	-
24.	Kim	-	+	T	S	-	-
25.	Quartal	-	+	M	S	-	-
26.	Nadhan	-	+	B	S	+	-

Qualitative service assessment: qualitative service assessment is of great importance in service modeling step as all modeling methods involve a phase where qualitative service assessment is carried out. However, qualitative assessment is not done in service identification step in some methods and is carried out in the next modeling methods. Owing to importance of services and the effect of qualitative factors on service identification, it would be better to concentrate attention on qualitative factors and service assessment in service identification step. Results from these methods were shown. Reliable values in table 1 are as follows:

Type of services: among all studied methods, six of them can identify any kind of software and business services. Accordingly, these methods can first identify business services in terms of enterprise business modeling and can then provide a set of software service candidates through addition of software details to them.

Identification strategy: three strategies are given to identify services among which middle strategy that focuses on genetic systems along with requirements and business processes will be determined in table 1 provided that corresponding columns associated with automation and identification strategy are being studied simultaneously. All automated and semi-automated methods are used top-down strategy for service identification.

Documentation: documentation can be divided into two groups:

The first one are evidences which describe application and service identification algorithm and the second one are evidences related to the results of case studies of methods. Among 26 studied methods, evidences have not been provided for only two methods. In addition, complete documentation has been provided for only three methods (sun, kohlborn, erl) and the rest of methods have offered part of evidences.

The support of tool: one of the most important units of measurement is the support of tool that is not paid attention in other research literature. This criterion (unit of measurement) is very significant in automated methods because if a proper tool is not provided for the method, it won't be used scientifically.

VII. Conclusion

We presented basic concepts of a service as the key element of a service –oriented architecture- a method for developing a software system, service – oriented analysis phase of service identification step and enterprise models. Service identification step, first step in developing service – oriented systems, is of great importance.

Enterprise models are used in this step. Enterprise models comprise a variety of business process modeling and enterprise business entities, each of which offers some advantages and disadvantages. Therefore, it would be better to use an integration of two models for identifying services. Business process can be modeled on enterprise entities by applying this method and services can be determined based on newer models. Then, we proceeded to study the methods that have been introduced to identify services so far. As a result, six versions were presented to assess them. Also, each method was analyzed according to expected criteria and exact features of service identification were determined. Finally, we came to this conclusion, after the existing methods were studied, that an appropriate method to implement service identification step is like the following one:

The proper method is semi-automated method in which qualitative features, reuse potentiality, loose link and harmony and unity are considered to identify services and services with proper range are identified and middle strategy is used to identify business services.

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