



## INFRASTRUCTURAL PHASES OF AUTOMATED SERVICE IDENTIFICATION FRAMEWORK (ASIF)

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### ABSTRACT

Although service-oriented architecture has been discussed extensively, its modeling phase has not reached maturity. Modeling activities relies on their infrastructural preparation steps such controlling method and input types determination that will form the service orientation characteristics. However, discussing and determining appropriate inputs in a clear and step-by-step form is still in its infancy., small and medium enterprises (SMEs) have not obtained SOA benefits due to the absence of a method with appropriate guidelines which are compatible with their limitations. This paper presents a review of possible input types and presents a road map and guidelines to select appropriate inputs for SOA modeling's based on firms capabilities as infrastructural steps of ASIF. In addition, the SOA committee justification and its responsibilities are also presented.

**Keywords:** SOA, Service Identification Method, BPMN, business goals, UML.

### 1. INTRODUCTION

Service oriented architecture (SOA) is an architectural approach to fill the gap between IT and business domain. Oracle as one of well-known software vendor consider that SOA support business-IT alignment and strengthen competitiveness by increasing agility and efficiency [3]. Furthermore, SOA has similar behaviors with self-organizing systems .e.g. dynamism and flexibility [4]. It also organizes and uses services to support reusability and interoperability between applications [5]. Furthermore, offering agility in business processes and building flexible information systems that meet the todays' high frequency of business changes is one of SOA enhancements [6].

Nearly to business concept, OASIS (advancement of Structured Information Standards) presents this definition "SOA is a paradigm for organizing and utilizing distributed capabilities that may be under the control of different ownership domains." [1]. According to above definitions and also numerous studies, SOA has two dimensions, business and technical orientation [7, 8].

Accordingly, inputs of SIMs (service identification methods) could be categorized based

on SOA dimensions, for example, business oriented or technical oriented.

As fundamental requirement selecting the appropriate input for SOA is critical because the input preparation is timely and costly process and also the business or technical orientation of a method is determined based on its input types.

Furthermore, supervision of the service identification phases is mandatory to satisfy all participants of SOA which can manage the implementation risks and strengthen the success factors. The role of 'SOA committee' and 'IT department' of each firm is super visioning to guarantee the IT-business alignment during service identification phases implementation and control the side-effects of SOA migration within all stakeholders. Consequently, in order to satisfy service identification necessities, those challenges have appeared as prerequisites of a SIM in a form of questions:

Q1: How to guarantee firms body support through applying SOA?



Q2: Which types of inputs are suitable to be involved in an automated service identification method and which criteria are important in selecting them?

The goal of this paper is evaluating existing service identification methods based on SMEs requirements and specification and extracting influence criteria in SMEs domain as based for SMEs specific service identification method. To answer these questions and achieve the objectives we done a literature review and prepared a framework to compare existing identification methods. In addition, because answering to mentioned questions are necessary prior to design other phases of ASIF they has been considered as infrastructural phases.

This paper has been structured as follow; section 2 presents related studies; section 3 justifies SOA committee establishment that being responsible for managing and supporting for successful SIM implementation. Next, a set of variety of input types have been ranked which represent input selection process and related discussion and followed by conclusion.

## 2. LITERATURE REVIEW

Inputs of SIMs could be categorized in different types according to a) selection frequency of each type by previous SIMs b) orientation of each input type, for example, business oriented or technical oriented. Majority of SIMs input types are, Business processes, use case, activity diagram, source code, user interface, database, enterprise goals and enterprise domain knowledge which as sample have mentioned by [7-9]. Theses set of pervasive input types will discussed in this section.

Business processes are so important since they convert input of enterprise to output which is the main cause of enterprise existence [10]. A business process is set of tasks that are placed and ordered based on the procedural rules [11]. However, business processes are not algorithm based entities but these kinds of inputs have used in the majority of service design and modeling methods. There is significant number of recent studies in SIM that focused on business process as input [8, 12-19]. Furthermore, Gu in [8] indicates this fact that business process consists majority of inputs among SIM methods that have been studied. A process model could be in a graph based or in a rule based form [20], besides it may be even informal process model that does not follow any standards of business process management models [21].

Whenever, the SIM focuses on capturing business tasks and its requirements from processes, the business process should be decomposed hierarchically up to achieving the atomic logical tasks that indicating as an important capability in BPM [22].

## 3. SOA COMMITTEE

SOA implementation is a multidisciplinary project that involves not only technical people but business side too. Therefore, due to non-uniform impressible sides, making consensus in decisions becomes vital in SOA success.

One of important things in SOA is its involvement with Business, which encourage business managers to be closer to the applications domain because they can see realization of their strategic plans as IT services and thus business managers feels that they have authority to change the functionality of web services and to give their ideas based on understandable and well-known documents such business process, goals, tasks, etc. unlike prior methodologies [23].

Managers involvement tendency depends to the relativity of an issue to strategic domain such architectural designing of service-based business environment, evaluating the business-IT fitness and making changes or tasks division of human environments [24]. All of mentioned manager's encouragement issues have been addressed by SOA and so the manager's tendency to involve in SOA design issues becomes a fact Figure1 The first issue needs a flexible methodology to derive business services which SOA realize it besides, service orientation according to the business oriented inputs the alignment of output web services is guaranteed.

In addition, based on literature review one of major fail points of the IT projects is enterprise management support [25, 26]. Besides, previous studies emphasize on the management role in any success of software implementation. This support exposes itself in securing the SOA project finance and using manager authority in realizing committee decisions.

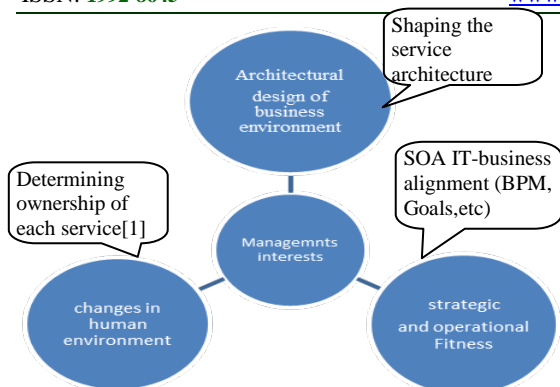


Figure 1: Business Manager Involvement Factors And SOA Characteristics That Can Address Those Factors

Consequently, a supervision group which consists of IT and business individuals such top manager, business departments responsible and IT employees will work under 'SOA committee'. SOA committees will leadership has been proposed to take the role of SOA implementation leader. During ASIF implementation phases many conflicts and differences e.g. in scope determination, candidate service prioritization, etc. between enterprise departments may have arisen that resolving problems and making consensus among them will effectively decrease implementation risks.

The proposed SOA committee members in the ASIF composed of functional employees who own the business processes as department managers, IT employees which have expertise in technical side and migration to SOA and top management. Considering the role of SOA specialist is a mandatory which can be from inside IT employees or an external SOA consultant with ability to analyze the enterprise assets from SOA view and auditing the business documents.

Effective interviewing skill is important to elicit hidden knowledge of the firm, because according to the survey results not only there is lack of ready to use business documents in majority of SME's but also managers and responsible employees are not familiar with standard documentation.

The SOA committee establishes its work from the first step of ASIF and their supervision includes all business related phases such scope determination, business process models elicitation and prioritizing the candidate services to make maximum involvement of business employees and consequently making consensus in service identification issues. The supervision committee steers information elicitation phase and evaluates

the information to realize enterprise capabilities, weaknesses and also obtain the opportunity to revise the enterprise functional activities. In addition, the composition of committee's member will result in improving the enterprise culture by information transfer of service orientation consequences and its necessity for efficiency to all employees.

Briefly, enterprise manager that participates in any SOA committee decision certainly will consider the required budget of each decision and so the budget concerns can be limited, besides; the committee relying on its members composition has enough authority to make decisions that change existing business processes that have been elicited thorough ASIF, by adding, eliminating or changing the follow of existing tasks.

ASIF includes phases that rely on technical tasks, for example, programming, clustering and computational operations, etc. thus; the ASIF framework proposes to give supervision responsibility of those phases to IT department due to the specific skills that are required. This division of roles according to the types of tasks will result in SOA committee sessions be limited to business issues and keep out of technical issues that are boring for non-technical individuals.

### 3. INPUT SELECTION PROCESS

Determining the appropriate input types of service identification is a critical decision because each input type according to its nature and capabilities will determine the orientation of output services. Basically, technical or business orientation of any SOA method has rooted in types of its inputs. Service identification methods have been used variety of input types as their resources to extract the service portfolio. According to ASIF that tries to align business with IT infrastructure the input selection has been discussed precisely and it has been considered as a critical decision and placed as infrastructural and primary decision before starting ASIF phases in order to determine appropriate inputs and to provide fit resources to obtain business-IT aligned services.

In order to evaluate and specify suitable inputs for SMEs firstly, a set of SME related criteria have been proposed based on literatures and survey results, then the input types have been ranked based on criteria, and then based on comparison results an input selection process has been proposed as guideline for SMEs to select their appropriate inputs based on the firms capabilities.



### 3.1 Appropriate Input for ASIF

In order to address special situation of SMEs that is highlighted by their weaknesses and strengthens which mainly rooted in their lacks of resources and expertise [27]. Accordingly, a fit's SME SIM should be selecting its input based on SME situation criteria to guarantee the compatibility of inputs in SMEs. These set of criteria have been described by authors in [2] which namely are Machine readability, Interaction details, Interaction details, Support the Business Goals, Decomposability, Clarity, Choreography, Easy to achieve by SMEs. The set of criteria has been tried to evaluate compatibility of each input with SMEs characteristics in order to increase the applicability of ASIF in SMEs which was rarely mentioned in previous studies. The rationale of proposing those criteria that is illustrated below is built based on studies published in [7, 28].

According to above mentioned criteria a comparison between major input types that have been used in previous researches has been conducted by authors [2]. The comparison of SIMs' inputs types based on criteria that are illustrated in the previous section was presented in Table 1.

### 3.2 Input Comparison Results

The inputs comparison' results emphasis on considering enterprise goals, BPMN and UML as appropriate inputs of ASIF in SMEs. Due to SMEs situation some above criteria get more importance such clarity that lack on it in each input type is considered as challenge within SOA implementation process. Consequently, input types such source code and data bases cause in difficulties and challenges in order to involve in a service identification method within SMEs due to their lack of expertise.

In addition, BPMN has taken higher rank which covers the SMEs requirements in service identification. Selecting the BPMN as input type is supported by two factors firstly, its affinity to business concepts that ease the business-IT alignment and secondly it's widely using in business and industries.

Besides, the UML diagrams such use cases and activity diagrams have taken high rank as the second standard document after BPMN besides their presence in SMEs is an important point that has been indicated by survey results.

It could be clear to recommend that a combination of inputs could be act as a complementary role to present maximum information from enterprise. Furthermore, in many

studies have been used a mix of input types. Clearly, a method that uses complementary set of various input types can cover the weaknesses of some inputs with strengths of other input types.

### 3.3 Legacy system in ASIF

Legacy systems importance has been discussed in many studies particularly within SMEs relying on their strengths points in including enterprise inheritance such as users' habits, business processes and other intangible elements that should be considered in any system upgrading however, ASIF has not directly applied them. Therefore, due to legacy system importance causes that lead to neglecting applying them directly has discussed in this section.

The major strength points of legacy systems are their including of user requirements represented by implemented business processes and the implementation cost of them. However, second point has less importance from first one based on interviewee survey results. On the other hand, common property within service orientation methods that relies on reusing the legacy systems such, reverse engineering or wrapping, log mining tool is their complexity due to using methods that strictly depend on high technical knowledge; hence majority of SMEs cannot apply such level of knowledge. Besides, case study results indicate that majority of SMEs use packaged systems which their source code is not accessible; therefore legacy oriented techniques cannot be applied on them. In addition, relying on bottom-up methods will deprive the SIM from benefits of business-IT alignments as fundamental outcome of SOA.

In order to utilize legacy systems assets, ASIF has been emphasizing on reusing workflow of legacy systems which have been reflected by their analysis documents. UML diagrams have normally attached with legacy systems specifically with customized ones. Activity diagram as flowchart based diagram has been selected by ASIF to be participated in service identification as input to describe the legacy systems embedded business processes. Therefore, ASIF address AD involvement necessities through its phases to reuse their embedded business processes. This hypothesis has been approved by the survey results which indicate the existence of UML documents in majority of medium sized firms.

However, using the AD through ASIF may impose designing diagrams again within Visual Paradigm but undoubtedly, it present the legacy



system workflow without need to more information elicitation activities.

#### 4. INPUTS SELECTION RESULTS FOR ASIF

To provide flexibility in input selection based on the firm capabilities and available resources we present an explicit road map that eases the selection of the appropriate input for enterprises.

In order to propose such clear process two factors should be applied to input options. Firstly, consideration of the required resources of SMEs to apply a specific input type e.g. skills, budget, etc. that force by responsibilities such as business process modeling, task extracting from activity diagrams, etc. Therefore, the input selection process tries to be as guide by proposing flexible input selection relying on SME based inputs comparison results. Secondly, the SOA committee should evaluate the achievable quantity and quality of each input based on the firm variables such as employee's experiences, enterprise budget and existing documents.

Based on above comparison results that the 'business goals' have taken highest rank in the comparison and thus is a necessary input type. Then, among other input types BPMN has taken high priority according to its capabilities that it can act as base for service life cycle and align the new SOA with business. Therefore, it is strongly suggested to SMEs that have embedded IT expertise within them to employ BPMN for modeling their business processes. Surely, the tendency in SMEs is to decrease the cost and required knowledge for preparing the SIM inputs. Thus, UML is considered as next proper input according to availability of UML documents in majority of medium sized enterprises that has been clearly indicated in survey results.

Consequently, as presented in the input selection process in Figure 1, SMEs that have IT expertise or have possibility to outsource the input preparation phase can rely on this capability to prepare required inputs that have been introduced as appropriate inputs such BPMN or UML diagrams.

The input selection process is relied on the input's comparison results which have been determined SME-fitted input types among them and also for inclusion wider range of firms by considering variety of situations.

Thus, the input selection process has been proposed consideration of the skills or required budget for preparing the BPMN or UML diagrams.

If the enterprise can offer the requirements of preparing the BPMN or UML diagrams, represented by minimum skills and familiarity with business process modeling or UML modeling and also presence of IT department or even IT employees. The next step is that SOA committee evaluates and confirms the collection possibility of BPMN or UML which depends on the existing document, available skills, time and cost of each one.

The next step is determining the best source of enterprise goals that could be varied from strategic plans to informal documents, management interviews, etc. Goals collection process unlike the previous step doesn't require deep internal skills or outsourcing and thus it can be directly supervised by SOA committee.

In addition, considering the budget factor becomes determinative in each decision making about inputs selection from SOA committee due to impose preparing considerable amount of resources for each selected input and so this factor has been mentioned in the input selection process.

The following guidelines can assist SOA committee in order to select an appropriate input:

Point 1: Planning an education program that include principle concepts such as enterprise processes, SOA, service, etc., for staff who participate in the committee to make them an active part of the enterprise service enablement.

Point 2: Collecting the SIMs input data is a costly task especially when it is outsourced to external consultants or a company. Therefore, relying on the available documents and self-enterprise skills to elicit and prepare them becomes important.

Point 3: Selecting SIM input types according to situational conditions to being fit with enterprise resources are strongly influence the SOA success.

Point 4: Focusing on using informal type of data that could be in non-standard forms or even non-written knowledge as individual experience or intangible routines and then translating them to formal BPMN or UML diagrams is essential in SMEs because of their lack in documentation.



## 5. CONCLUSION

In this paper the infrastructural sections of the ASIF have been discussed and so, namely, 'input selection process' and also 'defining the leadership supervision of the identification framework' in the form of SOA committee have been proposed.

Based on SME specific criteria the input types have been identified as 'business goals', 'BPMN' and 'UML' diagrams. In addition, the role of SOA committee as supervision of ASIF committee has been described. Briefly, determining appropriate input types and SOA committee as a responsible that has a supervisory role consist the infrastructure for the ASIF framework.

Business goals and BPMN have taken highest rank in the comparison and thus have been considered as essential input types in ASIF and input selection process guide.

The input selection process has been proposed consideration of the skills or required budget for preparing the BPMN or UML diagrams. If the enterprise can offer the requirements of preparing the BPMN or UML diagrams, represented by minimum skills and familiarity with business process modeling or UML modeling and also presence of IT department or even IT employees.

Future work will present ASIF details which will focus on practically presentation of a service identification considering SMEs situation.

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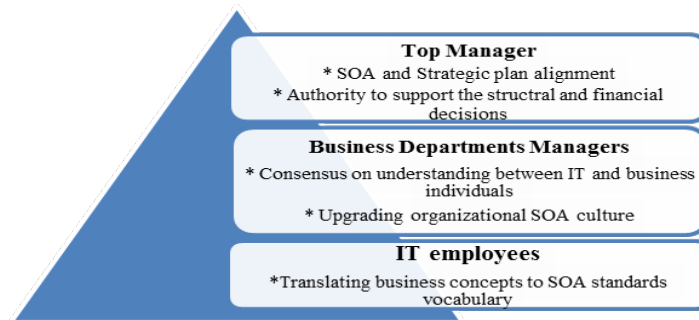


Figure 2 SOA Committee Structure And Major Responsibilities Of Each Member

Table 1: Comparison Of Sims' Inputs Types Based On Specified Criteria, ● Means Completely Fulfills The Criteria, ○, For Inputs That Only Fulfill Some Part Of The Criteria And ○, For Input That Cannot Fulfill The Criteria [2].

High level Top Down strategy Managerial			Low level Bottom-up strategy Technical					
Criteria	Input Type	Business Goals	Domain knowledge	Business process	UML		Source Code	Data Base
				BPMN	Use Case	Activity Diagram		
Machine Readability		○	○	●	○	○	●	●
Interaction details		○	○	●	○	●	●	●
Support of Business Goals		●	●	○	○	○	○	○
Decomposability		●	●	●	○	○	○	○
Clarity		●	○	○	○	○	○	○
Choreography		●	○	●	○	○	○	○
Easy to achieve by SMEs		●	○	○	○	○	○	○



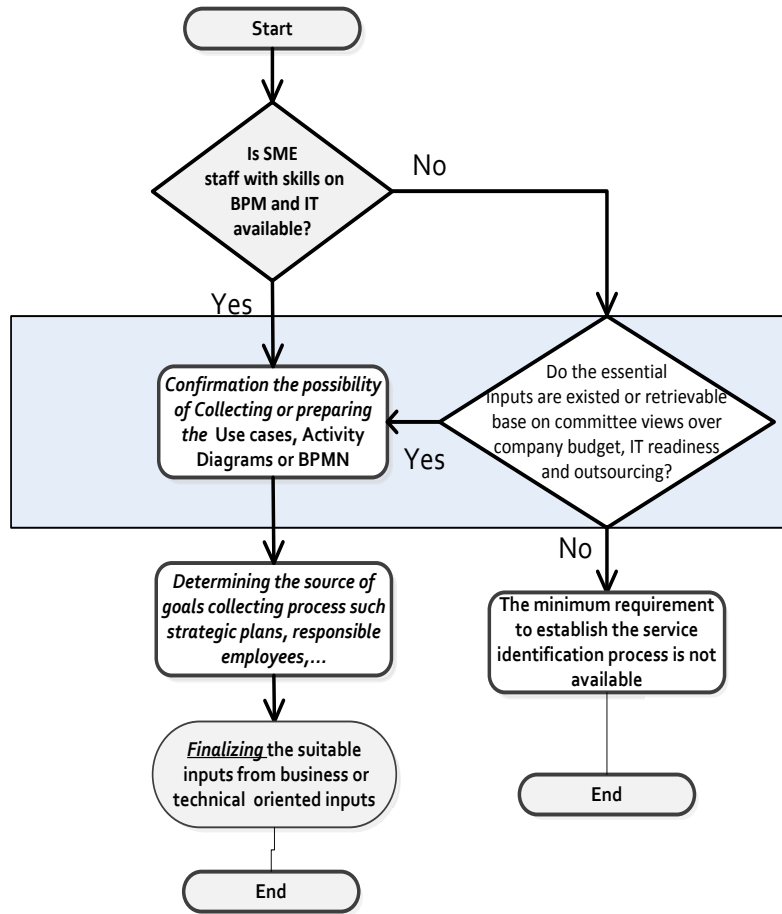


Figure 3: Suitable Input Selection Process For SIM In Small Size Enterprises