Maturity Model of Service Oriented Architecture

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Abstract. *Nowadays, organizations have becoming more dependent if Information Systems (IS), to improve their business process, frequently acquiring new services. Concerns about application integration are becoming even more relevant, as there is a need, from the organization's part, to know when a new service will be acquired, which information system will support it and how it will support existing systems. Integration in applications sometimes fail because there is no concern in alienation between enterprise architecture and the architecture of information technology. There are some methodologies created to evaluate which maturity level the integration of services are in, but the majority of AQ's are generic. To address this problem, we created of a set of response criteria for each AQ to the OSIMM maturity model to improve its evaluation method. Based on the results of the AQ, we can get the level of integration of services for each dimension and we can define the strategy, the roadmap that we want to set for our organization and what the benefits of this implementation, if necessary. As research method, we will use the Design Science Research (DSRM) and for the evaluation results we will do interviews and questionnaires, also taking into account the comments by the scientific community and the principles of Österle.*

Keywords: *Services, Information Systems, Maturity Models, SOA, Assessment Questions, Application Integration*

1. Introduction

Organizations are becoming increasingly dependent on SI to improve their business processes in order to facilitate decision making and implement new business strategies. Many organizations need to evaluate the state of maturity of its services and expenses in the acquisition of new services.

The heterogeneous integration of IT applications is a growing problem within and between organizations (1). Sometimes many companies who adopt a service-oriented architecture (Service Oriented Architecture) fail because acquire new services or develop applications that run on different hardware. These integrations fail because companies do not try to understand the organizational strategy of the company and its enterprise architecture (EA), vision, objectives and its direction (2). There is no alignment between the Information Technology Governance and Enterprise Architecture Governance that meets your needs (3).

These concerns are gaining increasing its importance to organizations because they need to have their services integrated and not have an organization based in SILOS, ie, departments. They need to reduce costs and have a more systemic view of their business strategy.

Not performing this analysis, there is a greater risk for the development of the organization, as a result of having some more advanced business processes than others, which can be an obstacle to innovation and evolution. If the organization is large, it would need a few years to detail and benefit from the integrations made (4).

A maturity model is used to compare the processes of an organization, focused on evaluating and mapping the level of the state ofprocess integration and, based on such evaluation, propose strategies in the short or long term, which should be implemented so as not to jeopardize the evolution of the organization (5). For various reasons, maturity models are generic and the evaluation method is based on AQ, the response criteria is dependent on the subjectivity of a consultant or the person who is going to evaluate that enterprise architecture, becoming the review ambiguous. The fact that these methods do not take account of each organization's environment is also a problem (6), because the solutions proposed run on many assumptions.

To address this problem, it was necessary to test some maturity models and, opted for the OSIMM OpenGroup model "object" of study, focusing on the AQ. It was found that many of the answers did not have the slightest detail, so we would not get a fair maturity level.

Because of this, we define our research problem as: how to evaluate more accurately the level of maturity of an organization that has adopted SOA?

Taking into account the problem in question, we propose a methodology that helps to assess more thoughtfully the maturity level of an organization that has adopted a service-oriented architecture (SOA). First of all we need to define 7 response criteria to each question of the 89 questions OSIMM model. The definition of this set of evaluation criteria will be based on a thorough review of the scientific literature and best practice assessment of a maturity model for a service-oriented architecture. The scale was based on seven response types to a particular AQ, which allow to assess the maturity level of each service is a certain size, as explained in section 5 -Proposal.

The validation of the criteria will be done through interviews addressed to the IT responsibles of the organizations, based on two metrics "Is usefull for SOA," that is, to what extent the criteria created by us are useful for evaluating the SOA, and "Is easy to answer", which allows us to know whether the criteria we set are too complex to answer with an assessment from 0 to 5, using the Likert scale method.

After validation of this set of criteria we have applied our most effective assessment method in the maturity level calculation of an organization that has adopted SOA.

To demonstrate the use of our solution, we apply the method to several Portuguese organizations, so that the maturity value is more accurate based on the criteria choices created by us for the model questions OSIMM. In terms of case study is interesting because it will allow ascertaining the dimensions which organization is more evolved and, set the roadmap as evolution strategy with the criteria that have a lower level of maturity.

2. Problem

This section corresponds to the problem identification and motivation step of DSRM, which defines a specific research problem and justifies the value of the solution.

The reasons that led us the implementation of this work are linked to the fact that, today, in private or public organizations, if they spend thousands or even millions of euros in buying software and then lack the most important feature that is integration. That being poorly executed, problems arise in organizations such as loss of informational data, wrong parameter or even data redundancy.

Thus, we define the main concern that the maturity models basing its assessment on generic AQ (7) (8).

We define the problem of our investigation with a question: How to assess more accurately the level of maturity of an organization that has adopted SOA?

The main motivation to resolve this issue is related to the fact that, more and more, middle or large organizations were aware of the technology they had and how they should benefit from the IS , in order to save resources and, at the same time, to be technologically updated.

There is therefore a need for an evaluation methodology of the services, simple and adjusted to reality. Therefore, our proposal will bring concrete benefits to the organization, so that they can make informed and appropriate choices with the results of our evaluation method.

3. Related Work

This section covers half the step of the definition of the objectives of a solution of DSRM, in which we will infer the goals of a solution from the problem definition and related work. Na secção 3.1 e 3.2 we point out which technologies are good for SOA, like web services. Support standards will also be approached. In sections 3.3 and 3.4 we will explain the purpose of maturity models, comparing them and its respective evaluation methods, especially for SOA.

3.1 Web Services

As stated above, web services are an SOA support technology. A web service is seen as an application accessed by other applications through the web, should be loosely coupled, self-contained, web-enabled programmable application That can be described, published, Discovered, coordinated, and configured using XML artifacts for the purpose of Developing distributed interoperable applications using certain standards (4).

The reference standards are SOAP, WSDL and, UDDI, key to the interaction between web services. Currently there are many standards, based on core standards such as security, transactions / coordination, reliability, policy.

SOAP is a standard used for exchanging information between web services. (W3C, 2007) SOAP is a wire protocol that defines the communication between one or more applications. The wire protocol is used to facilitate transport between systems using the network. HTTP is the most widely used transport protocol for SOAP messages because it is not blocked by firewalls.

3.2 Service Oriented Architecture

To understand the concept of service-oriented architecture (SOA), we need to understand the architecture and what problem SOA tried to solve. SOA was developed by applying the concept of software architecture to solve the problem of how to relate distinct systems, so that they could work as a whole systemically (10).

3.2.1 Problems in SOA

In traditional organizations, the functional structure is organized by departments, sales, human resources, etc. Departments themselves have acquired their own applications and customizing them according to the requirements of each department (11). The problem of an organization to be in SILO'S, is that each department manages its own applications, there are different applications in the organization, which makes it difficult to integrate these SILO'S (2).

For an organization, the holistic view is not the most wanted, the existence of SILO'S extends for different reasons. One reason is related to autonomy, because the departments do not want to lose power in the management of independent projects that have to control. Another reason, and the main one, is the fear, the organization's stakeholders fear change for a large integrated application over existing ones. However, the interaction between the SILO'S with automated support is needed so that the business process spans multiple business functions.

3.3 Maturity Models

In this section, we will explain what a maturity model is, its aim and which maturity models adopted SOA.

The maturity model is a structure that is used as a reference for comparison and evaluation of certain aspects of the organization, such as communication, services, processes, satisfaction, security and strategic objectives. A maturity model is used specifically when it comes to evaluating the ability to implement strategies for the organization for the purpose of evolution or to control the risk thereof from said strategies.

The maturity model should (2):

- Provide a common language and a common vision;
- Be able to prioritize actions;
- Provide a way to define what is implemented (the-IS) and which plan to improve processes (to-BE);
- benefit of having documentation data management experience;

3.3.1 Maturity Models SOA

Being the our focus the object of our study of maturity models for a service-oriented architecture, in this section, we will analyze their structure and their evaluation method. The models considered are: Oracle Maturity Model, OSIMM V2, Microsoft SOAMM, CBDI. Any of these models differs in the states of maturity, the dimensions in which they operate and the evaluation method. Table 1 lists four maturity models that are different in many aspects. The questionnaire SOAMM-Microsoft and CBDI are not publicly available.

Maturity Models	**Author**	**Maturity Levels**	**Dimensions**	**Evaluation Tool**
Oracle SOA Maturity Model 2006	Oracle	5	8	Questionnaire
OSIMM V2 2009	The Open Group	7	7	Interviews/ Questionnaire
SOAMM – Microsoft 2007	Microsoft	4	4	Interviews (n/a)
CBDI 2007	CBDI	5	7	Interviews/ Questionnaire (n/a)

Tabela 1 –Maturity Models for organizations that have adopted SOA

3.3.2 Comparison between models

Aspects in which we focus, to explain the models were: the name of the maturity stages, the dimensions in which they operate and what is the assessment method. Evaluation methods may be developed with support in interviews, with the help of questionnaires, or with data collected in the

organization. The main difference between the models is that some are based on empirical data such as Oracle SOA-MM and _ SOAMM-Microsoft, while the remaining SOA-MM are designed based on expert interviews. This is because the SOA is still a new technology and made implementations are still scarce (12).

The SOA maturity models focus mainly on the progress of the adoption of SOA. Further, the maturity level differs between the two models. The Microsoft SOAMM and the CBDI SOA MM focus mainly within business services and application services in the organization. The scope begins to grow, how well and how many more services are needed to integrate into any organization or organizations.

Oracle MM and the OSIMM focus on the maturity of the integration of application services in the context of organization, but not depending on its scope. Organizations have not progressed that much in the adoption of SOA, so most of them is probably a maturity level 1 (7) (13).

Both OSIMM and CBDI models have the same dimensions and indicators which cover both technical and organizational level, for the adoption of SOA, although in OSIMM, the initial state ie, the services belonging to the foundation level, does not have any application of SOA, only prerequisites to achieve the initial state of CBDI.

The organizational level, we intend to realize the structure of the organization its relevant aspects.

The maturity levels of OSIMM model are based on services. In a situation with a good level of maturity, the services are virtualized and can easily be used in different business processes.

With the level five OSIMM, business processes can be integrated with other lower-level services, loosely coupled in design time, which is critical for the organization to support the reuse of shared services internally or between organizations.

The states of CBDI explicitly focus up in the use of services in the organization. The services are used for the first time, as a pilot project and then are centralized and shared between the organization SILO'S.

3.4 Conclusions

The maturity models support the same SOA adoption process as a roadmap. There are several maturity models to adopt SOA in an organization, we refer some in section 3.3- Maturity Models, but these models have several flaws.

The **first flaw** is that the models, except the OSIMM, are not independent of technology, they are created by software vendors or consulting firms.

The **second flaw** is that models like the SOAMM-Microsoft take no thought for the management and organizational issues. Adopting SOA is a long and complex way. Understanding and management commitment is essential to facilitate their adoption.

The third flaw is where my dissertation focuses on, weak SOA assessment tool on existing models. Using an assessment tool allows the organization to evaluate their own state of maturity, what you need to get a better state of maturity and how to get an improvement plan, recommend process.

Although some of maturity models presented in Section 3.3- Maturity Models have their own methods of evaluation, we decided to refine the OSIMM evaluation method, which is the most complete, and try to create a more considered assessment.

4. Objectives of the solution

This section covers the steps of definition of the objectives of a solution of DSRM, in which we will define the objectives of the solution, based in the problem identified and in the related work described previously.

Taking into account the problem that we have identified in Chapter 2, the main flaw is that the maturity models based its assessment on generic AQ, thefore there is no way to assess more accurately and with tangible results of an organization's maturity level who adopted SOA.

The main objective is therefore to create a method that allows any organization to do a self-assessment of its service-oriented architecture. Based on these results to know the strategy, the roadmap that the organization wants to evolve. This objective can be divided into two parts, (1) the establishment of criteria for the AQ OSIMM maturity model, based on the literature and feedback given by experts in the field of Enterprise Architecture, (2) use this set of criteria for drawing the evaluation method, allowing a more accurate assessment of the level of maturity of a service-oriented architecture. By combining these two parts we can create a method to assess the SOA maturity level, with concrete results and adapted to the organization, improving time in decision making.

There are specific goals that we want our solution proposal tool fulfill (1) solution applicable to any organization, (2) clarify the level of maturity of an organization's services, (3) be easily understood by any decision maker / interviewee, not only by experts, (4) allowing analysis by the results of the evaluation method, (5) build a strategic roadmap for the organization.

5. Proposal

This section corresponds to the design and development step of DSRM, in which we create an artifact to solve the problem identified. The problem described in section 2 was: How to assess more accurately the level of maturity of an organization that has adopted SOA?

Our proposal is a more effective evaluation method for calculating the maturity level of an organization that has adopted SOA.

This chapter is divided into two sections which correspond to method steps in which our proposal is based. The first step corresponds to the goals that we want to fulfill our proposal and what the grounds for elaborate. (Section 5.1).

The second step will be to structure the evaluation method that entails the development of criteria for the AQ OSIMM maturity model. (Section 5.2).

Our proposal will help decision-makers in the adoption of SOA to the organization. Through the analysis of the assessment results, the decision maker can evaluate what the roadmap that your organization is going.

Our proposal is to apply that method of evaluation to four organizations and obtain a level of maturity necessary by size and overall.

5.1 Proposal Objectives

For that reason, we decided to create criteria in order to get more accurate responses of the OSIMM model. The method begins with the structure of the model.

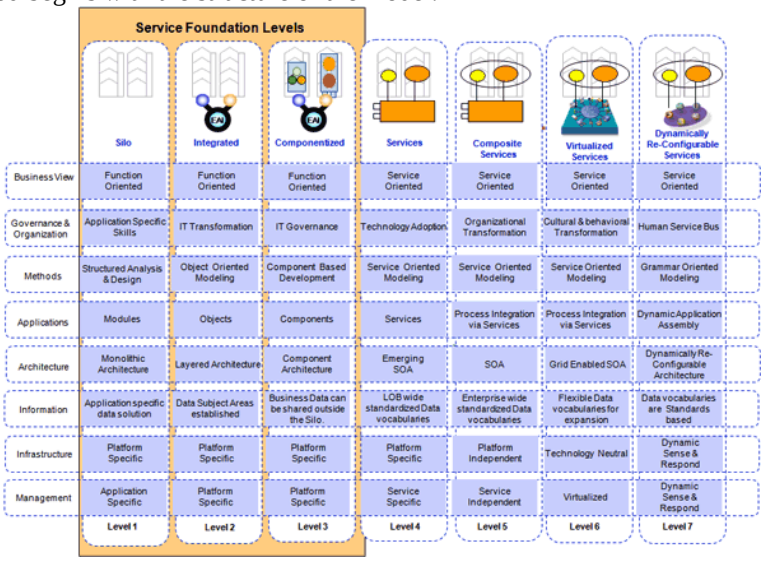

Figure 5 - OSIMM Maturity Matrix.

The OSIMM is a standardized model that helps organizations to adopt SOA more easily, increases the levels of maturity on the seven aspects of the organization and represents a guidance on how to improve the maturity of each service, according to some dimension (14).

Our proposal is going to help the deciders to make better evaluations, by defining concrete response criteria for each question, ranging from 0 to 7, that correspond to maturity levels of the OSIMM services, plus two more options “Do not know” and “Do not answer”.

This way, it is possible to assign a quantifiable value for each questions' answer, as explained on section 5.2- Evaluation method.

5.2 Evaluation method

The demonstration and application of our proposal is described in the next section, where we will present each step of our proposal in a real case study.

On the **first stage** we start by making a revision of all evaluation methods used on the maturity models that already exist, as described on Chapter 3.

The **second stage** of this evaluation method consists on the creation of the response criteria, according to the question, for our evaluation method, which are made according with the AQ that the OSIMM

For the criteria creation, we start by making an analysis of all OSIMM questions', these being 89 and create 7 response criteria for each question, which will define the maturity level of the services. The criteria were based on the analysis of the literature related work.

To revise the literature, we followed the methodology proposed by Jane & Richard (15) and making an extensive research, with some date restrictions. For this search, we used the Google Scholar as well as IEEE Xplore and also CBDI Forum which has experts in the SOA community and some well known articles which are well accepted by the scientific community.
On an initial search, we found over 100 articles and by analyzing their abstract, introduction and conclusions, we identified articles that talked about Maturity Models, SOA, Services in IT, etc. Then we did a close inspection of those articles with the purpose of finding those whose contribution would benefit our research. We ended up by choosing 18 articles that helped us create the criteria that we would use on our evaluation method.

This resulted on a definition of **623 response criteria** for OSIMM's the evaluation method, which corresponds to 89 types of dimensions multiplied by the 7 maturity levels of the services. On Table 3 presents one of those questions and their corresponding 7 service maturity levels, more specifically Business Dimension. The remaining criteria can be found on Appendix B - Criteria responses for AQ of OSIMM.

Question 1) How are identified the major business drivers for this initiative?
There are no business drivers
There are some business drivers documented and explicits in business process integration
Organization's business drivers are documented as cross-organizational business objectives.
The business drivers are identified throughout organization internal processes
The business drivers are identified throughout organization external processes
The business drivers are identified throughout organization internal and external processes
The bussiness drivers are adapted to frequent business process changes
Do not know
Do not answer

Table 3- Criteria elaborated for questions 1 and 2 of Business Dimension

Lastly, at the **third stage** we analyze the new evaluation method in the organizations. When formulating our proposal, we validate our criteria catalog by interviewing organization IT experts by using the likert scale method (16) from a range of 0 to 5 basing on two metrics, **"Is usefull for SOA"**, meaning, in what way the criteria formulated by us are useful to the OSIMM questions evaluation and **"Is easy to answer"** which allow us to know if the criteria used in OSIMM questions are too complex. This evaluation is detailed on Section 7.1.

With the information previously described, we propose that our work suggests improvements that can help decision making. Our research proposes **a more effective method to calculate the maturity level of an organization that adopted SOA**.

6. Demonstration

This section corresponds to the demonstration step of DSRM, in which we demonstrate that the proposal can be used to solve one or more instances of the problem.

The objective of this work is to create an evaluation method to evaluate the maturity of a service oriented architecture. To demonstrate this, we chose the Order of the Attorneys (OA), which is a private organization and with an heterogeneous service oriented architecture, although other possibilities were also assessed such as the Instituto Publico which is a public institution, the city council of Mirandela (CMM) which is has a low population level, the Portuguese Navy, which is a governmental institution and Link, a company that focuses on software development for companies.
This section is divided in three subsections, corresponding to the steps of our method described previously.

6.1 Structuring the assessment

This step begins with the definition of the criteria accepted by respondents and the assessment made to organizations.

In Section 5.2 we described the research process for the creation of a criteria catalog for maturity assessment method for a service-oriented architecture that made sense in all organizations.

In our demonstration, the respondent(s) used the 623 criteria because they fitted for the evaluation method as *"Is usefull for SOA"* and *"Is easy to answer"*, none criterion was rejected as explained in Section 7.2 .

With our method we can plot the level of maturity of the services that the organization is, in each dimension, and identify their characteristics, depending on their answer. The weights assigned to the

responses were supplemented with the ones already present on OSIM, we just define more descriptively to allow a more assertive response.

For the assessment we used a questionnaire drawn up in Google Forms which allowed us to develop the graphics shown below with the case studies undertaken. The assessment with the various organizations allowed us to assess the maturity level of service-oriented architecture using our assessment method adapted to the OSIMM model.

6.2 Order of the Attorneys

After a thorough analysis of each dimension, where we analyzed for each dimension the maturity level, we can check what criteria had a low level of maturity based on the answers using our evaluation method, we can then facilitate the creation of a roadmap for our organization.

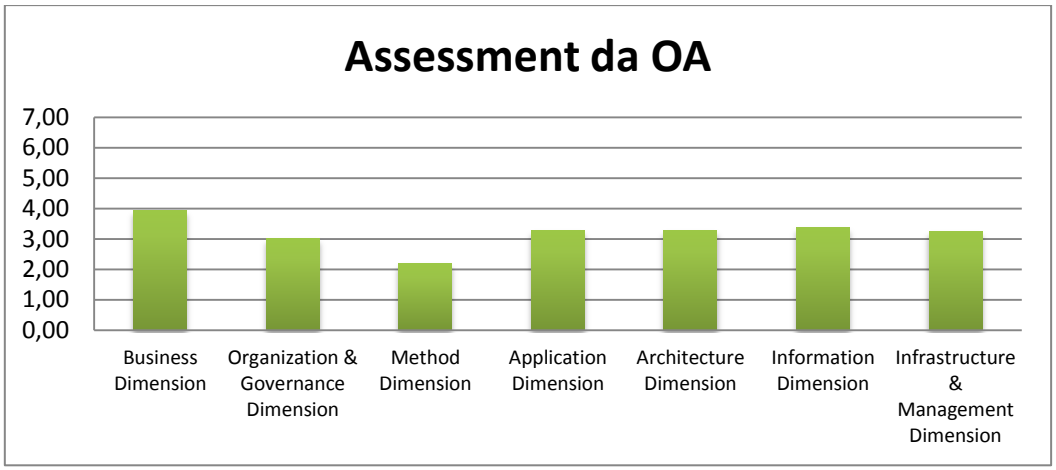

Figure 1 - Maturity level obtained in OA

Above, in Figure 14, we can see the level of maturity reached in all dimensions from which we conclude that **the maturity level reached by OA was 3.19**, we can perceive that we are closer to the level 3 or 4 maturity.

6.3 Analyzing the results do assessment geral

In this section we present the assessment of all organizations in which we apply our method to assess maturity of a service-oriented architecture.

The results obtained were made to the Order of the Attorneys, city council of Mirandela, Instituto Publico, and Link are as follows shown in Figure 15.

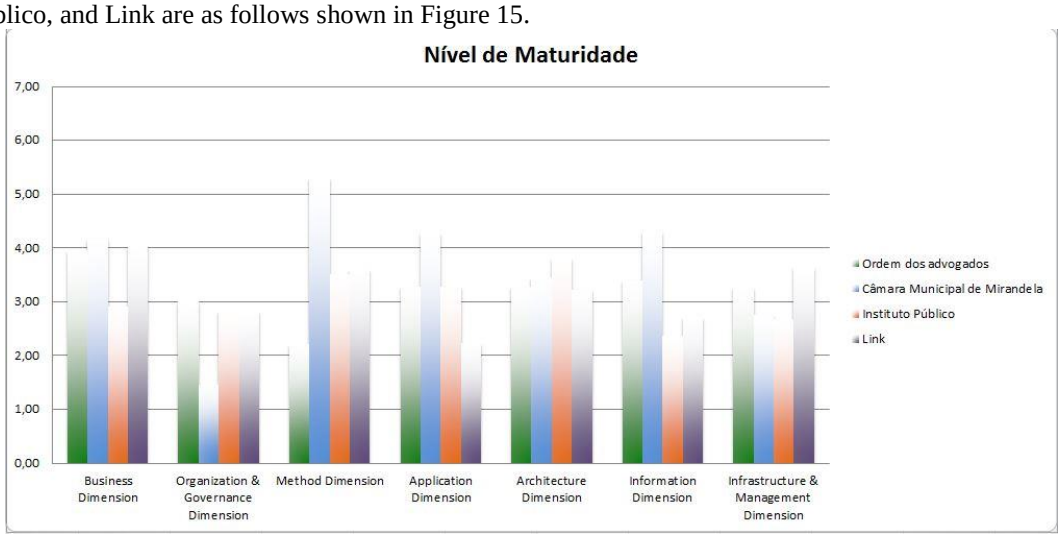

Figura 2 - *Organization assessment*

Maturity levels

Order of the Attorneys 3,19
City council of Mirandela 3,67
Instituto Publico 3,05
Link 3,18

The organization with the highest score is CMM that has a maturity level of 3.87.

By analyzing the results we can see that there is some consistency in them, effectively, the CMM does not develop its own software, only manages, who works development is Medidata that, of course, must have a higher level of maturity, because city councils have very complex structure. Medidata, according to sources of IT Head of CMM, is a software application used in large municipalities, covering a large number of services.

The organization that possess a lower level of maturity is the LINK with a 3.18 score.

Link, is a software house and is involved in SOA Projects, did not get such a high level of maturity, because their assessment was made based on the services that the company had, not the ones it served to third parties.

As the results show, we can conclude that all organizations are located in the maturity level 3. The maturity level 3, according OSIMM, states that "The IT systems in the silos have been analyzed and broken down into component parts, with a framework in which they can be developed into new configurations and systems. There may also be some limited analysis of the business functionality into components. Although components interact through defined interfaces, they are not loosely coupled, which limits agility and interoperability between different segments of the organization (or even different organizations within the business "eco-system"). This causes difficulties in development and deployment of shared business processes. Business and infrastructure components are discrete and re-usable through code and EAI re-use techniques. However, they are often replicated and redundant."

7. Evaluation

This section corresponds to the evaluation step of DSRM, which aim to observe and measure how well the artifact supports a solution of the problem. To make the evaluation we used interviews with practitioners and the Moody and Shanks Quality Framework (17). We will divide this section in the two evaluations.

7.1 Interviews with practitioners

The purpose of the interviews with practitioners is, to validate our research, the problem, the proposal and the results of the demonstrations. Our solution was designed based on the literature, giving us strong theoretical foundations for the beginning of our research.

However, we thought it would be important to have the perspective of IT professionals working in this area. That said, we interviewed 5 IT professionals from larger organizations with an average of 15 years of experience in Information Technology. Our goal was to understand the criteria that are really relevant to assess the maturity level of a service-oriented architecture in organizations using our method.

As a starting point, we chose to use the OSIMM model. The choice of this model was justified earlier (Section 3.5).

The interviews were semi-structured and consisted in completing a questionnaire through Google forms with a duration of 60 minutes, approximately. To support the interview, we created a questionnaire to which respondents indicate which criteria, created by us, could be useful for our evaluation method to assess the maturity of service-oriented architectures. The results are shown in Figure 16:

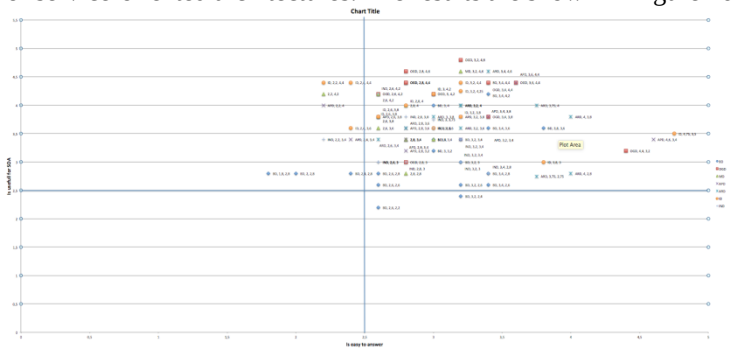

Figure 3 - Analysis of the interview result

The results show that all the criteria are directly related to the evaluation of a service-oriented architecture. Although some criteria have had a weaker assessment, none is on the 3rd quadrant, which shows that they are all useful. After the analysis, we also noticed that 79 criteria had a rating higher than 2,5 from a 0 to 5 range for the metrics that we defined, "Is easy to answer" and "Is usefull for SOA". As we can see in Figure 16, all the criteria are in the 1st quadrant and only 10 criteria are in the other quadrants.

That said, we used all the criteria for the development of our research method because this method has necessary and sufficient criteria to evaluate a service-oriented architecture. In this case all the criteria were important.

7.2 Moody and Shanks Quality Management Framework

The Moody and Shanks Quality Framework is the result of research on how to evaluate and improve the quality of data models from the perspective of the multiple stakeholders and proposes eight factors (4). We applied this framework to the demonstration by asking the decision maker about these eight quality factors and the results are shown then:

- **Perfection**: the proposal was analyzed taking into account the evaluation criteria, the information that is directly related to the method. Overall, our proposal is complete, given that the assessment criteria needed to assess the maturity of a service-oriented architecture are present in the catalog we have created.
- **Simplicity**: our artifact is simple to follow, taking into account the opinion of the interviewee, and confirmed that is easy to apply.
- **Flexibility**: our artifact is flexible, it is possible to use any kind of organization, analyzing each criteria or as a whole.
- **Integration**: our proposal is consistent with the needs and goals of the organization, as it is built directly with the respondent. The result of our proposal is a response to an effective method in the evaluation of maturity of a service-oriented architecture, so help the interviewee to make a decision.
- **Understandability**: professionals consider our proposal easy to understand, because the concepts of service-oriented architectures used are the same as traditional architecture concepts, there are some questions that are more difficult because they are complex.
- **Executability**: professionals showed interest in using our proposal, but its executability depends on the internal policies of each organization; anyway, admit using it as a decision tool in the future.
- **Integrity**: it is extremely dependent on the respondent since there is no other constraint for the definition of criteria. Our proposal relies and is based on interviews and observations.
- **Accuracy**: The proposal was considered valid for the intentions of the professionals, but the accuracy is dependent on each organization.

In summary, almost all quality factors were achieved. However, factors such as health and responsiveness have been partially achieved. This is due several factors: first, there are no rules or restrictions to support the entire integrity; secondly, not all professionals found the proposal easy to understand in the beginning. But after a period of adjustment they felt more comfortable. On the other hand, factors such as implementation were not checked because there is too much bureaucracy to implement this type of solution, although in organizations where we did our assessment did not impose any constraint.

8. Conclusion

In view of the identified problem: **How to assess more accurately the level of maturity of an organization that has adopted SOA?**, a problem encountered when organizations need to assess their state of maturity, our research proposes as a solution **a more effective method to calculate the level of maturity of an organization that has adopted SOA**. This solution is based on criteria set ranging from one to seven, corresponding to the maturity levels OSIMM model for each question.

The limitations of our literature is implicitly related to the methods of evaluation of maturity models for SOA, not getting any results of a Assessment made to other organizations based in other maturity models, we rely only on how the assessment was carried out.

The contributions of our proposal consist on an effective method to evaluate the maturity level of a service-oriented architecture, answered in a concrete way to our research problem, allowing the evaluation of the maturity of an organization, and develop a recommended process according to the analysis of results through graphics with the proposed method. This allowed us to help the decision maker to make a decision for the future of your organization through a roadmap, identifying the specific aspects that need to improve in order to be able to achieve the desired level of maturity.

In addition, during the preparation of the proposal we have created a criteria catalog to assess the maturity level of a service-oriented architecture for an organization. The proposal itself is simple and has very well defined steps that can be used to assess only one dimension specifies or global. The widespread use of this method will help organizations better understand what exists in the market and also to know the flaws in the organization of services.

We also believe that our proposal will help organizations save financially from external audits, thereby using this method to make a self-assessment.

For future work, the first step is to do more demonstrations in all types of organizations (public, private, large and small dimensions) to prove in a definite way that our proposal produces interesting and useful results that can be used to improve the maturity of the organizations services. This requires overcoming the barrier created by the research organizations of this kind.

Second, to make our proposal easier to apply, it would be good to create a software that produces an automatic report according to the selected criteria in order to make the evaluation more intuitive and attractive to perform analysis of this kind.

Also, to create a recommended automatic process as an interactive and explanatory guide with outputs of the evaluation method for organizations to know what the roadmap they need to set in order to meet the right strategy for that organization.

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