Enterprise Architecture Optimization Scenarios Evaluation

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Abstract: Today organizations are a complex system, composed of different types of elements, working together. Given the nature of organizations, they must deal with change, at some point of their lifecycle, in order to improve their activity. Since they are complex systems, deciding what changes to do or not, is not a trivial problem to solve. Furthermore, there may be several enterprise scenarios to choose from in a given situation. In this work we intend to analyse the problem of selecting enterprise scenarios, and propose a methodology to guide and formalize, this kind of analysis. Our methodology is based on the multi criteria analysis, and proposes GQM as a method to select and align metrics with business objectives, and also incorporates SWING, as weighting method in order to compute a global scenario score, from the value of single metrics. Regarding the metrics it is also presented in this thesis a group of metrics that allow to differentiate scenarios based on the quantity of change impact they produce on the overall architecture. Since there are dependencies between enterprise architecture elements, changing an element will in most cases cause the need to change other related elements, and this is change impact is what the proposed metrics aim to quantify.

1 INTRODUCTION

An organization is a complex system, composed by different types of elements, this elements are connected have dependencies between them. When a organization face a change situation, multiple scenarios may be available to implement that change, each of them with different impacts in the organizational structure, and opportunities.

The decision of which scenario to implement, is not trivial, and some methodologies to solve this decision problem, have already been proposed.

One of these methods is multi-criteria, analysis, this methodology requires a set of metrics to quantify and compare the existing scenarios, a set of weights that will allow us to aggregate the individual metrics result in an overall scenario score. A formal evaluation method has its advantages over an informal evaluation, because it will produce results that are better supported and justified, when compared to the results obtained informally.

In this thesis we will propose a framework to support and guide, the problem of selecting enterprise architecture scenarios, based on multi-criteria analysis.

Figure 1: Scenario selection problem.
1.1 Enterprise Architecture

The enterprise architecture, by definition is a representation of a real world organization, either in an “As Is” state, or in a possible “To Be” scenario. This representation can be compared to a city’s architecture, although it hides some details about the real city, it gives us a high level view. This holistic view on enterprises can be used to extract some broader indicators about the status of the actual organization, enabling us to place some characteristics in evidence.

The creation of an enterprise architecture, is an essential step in a modern organization. It allows stakeholders to communicate and facilitates decision making within the organization, by creating a common understanding of the organization and its elements (Johnson et al, 2004).

It is not only a communication tool but it also allows to understand how the different components of an organization, actors, processes, applications interact with each other, and assure that they are correctly aligned and together contribute to achieve the organizations goals (Lankhorst, 2009). It is also an evaluation tool through the usage of metrics that allow us to check the organization status regarding certain qualities (Vasconcelos et al, 2005).

The framework proposed in this work, is one of such evaluation methods, with the objective of helping in the scenario selection problem, described early.

The structure of the paper is as follows, first we start by defining enterprise architecture in the context of this work, and why its evaluation is important. Then we present how multi-criteria analysis adapts to this particular context and what steps are needed to conduct the proposed analysis.

Then we describe a method to realize change impact analysis over Archimate models. After we present our framework and give an example of its application. Finally future work and conclusions are presented.

2 RELATED WORK

2.1 Enterprise Architecture Evaluation

Since enterprise architectures represent the real organizations in a holistic view, with its elements connections and rules (Fischer and Winter, 2007), it is possible to evaluate the organization through its architecture, using metrics (Vasconcelos et al, 2007).

In our proposal, this evaluation corresponds to apply a set of metrics, to a set of scenarios. Through the application of these metrics the different scenarios will be scored, and their score will be used to compare them.

These metrics are defined as a way to measure and evaluate different qualities, and their objective is to reduce the uncertainty level related with some reality by quantifying it.

According to (Blackburn and R. Valerdi, 2009) the metrics must be aligned with some objective, in order to quantify it.

In this work we also propose a new type of metrics that can be integrated in the enterprise architecture evaluation, the impact change metric, described in section 3.

Our goal is to realize a multi-criteria analysis, using metrics as the criteria, and the enterprise architecture scenarios as the possible alternatives.

2.2 Multi-Criteria Analysis

Multi-criteria analysis is a method for selecting an option given a set of criteria. In other words, it is a process to discover the most preferred option, given a set of criteria (Dodgson, et al, 2009). It allows us to structure a complex problem with multiple options and restrictions. This is possible by identifying the existing points of view over the problem, and analyse them one at a time, and then through the usage of a weighting method compute the overall result of each alternative.

This method has been widely tested in various contexts with good results, supporting the option selection problem in a structured and formal way.

There are some variants of multi-criteria analysis, depending on the selected method to realize each of its steps. Nevertheless there is a common set of structural elements present in all the multi-criteria analysis methods:

- Criteria: they represent a stakeholder’s point of view and concerns in the problem. It’s possible to create the problem’s set of criteria using two approaches, bottom-up or top-down, they are described in section 2.5;
- Alternatives: are the scenarios which we are evaluating, the possible options to choose from;
- Decision makers: are the stakeholders in the problem’s context, they must be able to understand the criteria, in order to give their preferences;
Uncertainty: since not all factors can be controlled in a given context, when we build the alternatives, different possibilities regarding the uncertainty must be generated.

Environment: is the whole context where the problem and the analysis are developed. There are a multitude of factors that can affect the analysis, and the best solution can be different depending on the context.

Our objective is to reuse and adapt the steps identified in the multi-criteria analysis process to the evaluation of enterprise architecture scenarios.

In section 4 we will show how these steps were used to construct the proposed method.

3. CHANGE IMPACT

Since the elements of an organization have dependencies between each other [3], a change usually isn’t contained only within the scope of the modification, but can propagate through the connected elements and layers, resulting in a broader impact than expected. It would be a strategic advantage, if one could evaluate and measure the different possible scenarios and compare them in respect to the change impact.

Identifying the change impact is proposed in [1], through analyzing Archimate enterprise architecture models, by marking the elements with a type of change, extend, for adding a functionality to an element, modify, for removing some of the capabilities of the element, or delete, in case an element is completely removed from the architecture.

Besides the three situations for impact covered in [1], we wanted also to consider the impact of adding a new element to the architecture, the “Create” situation. This situation can be seen as adding a new behavior, data, or structural element to the architecture, being the only difference between this case and the extension situation, the fact that there is no initial structure, behavior or data to preserve, meaning that the elements connected to this new element, must be extended in some way in order to support the new interactions associated with the new relationship.

Depending on the type of impact and the relationship between the objects, we can decide if propagation of change occurs or not.

Through the application of these rules, we can obtain an Architecture model that represents the changed elements for each given scenario. These models can later be evaluated, using dimension metrics derived from the ones found in [4] which we propose. These metrics will allow us to get a relative score of the change dimension, and compare the scenarios, regarding their change dimension.

3.1 Impact Metrics

In order to quantify the change impact, a series of metrics are proposed to compare the impact in different scenarios. These metrics are derived from the ones proposed in [4], and although simplistic, they allow us to have a global view of the architecture change impact dimension, which sometimes relate to other architecture qualities as ease of maintenance, or modifiability for example. In this case our goal is to measure the consequences of implementing a given scenario in terms of change impact. More objects being impacted, marked as (Create, Extend, Modify, Delete), means a bigger effort in terms of scenario implementation [1], if we assume that all objects require equal effort.

Since an Enterprise Architecture approach is composed of several domains, and each one with his own object types and structures, having metrics to calculate the impact on different domains and object types, would be a way of knowing which are the most impacted domain by a given change. This will allow us to compare between scenarios and to identify which is the one less impacted on one given domain as also on an overall view.

It is possible to define more dimension metrics than the ones presented, concerning different objects and domains impact. The three proposed metrics are simply illustrative, and pretend to measure the domains used in the example (Business, Organization and Application).

4. PROPOSED SOLUTION

The procedural structure of the analysis presented over the next sections, is shown in Figure 2. For each of the steps we present possible methods to implement the given step, focusing on the enterprise architecture scenario evaluation problem.

Figure 2: Proposed method steps.
4.1 Context definition

This is the first step of the analysis. The scope and constraints of the problem are defined, in order to have a complete view of the problem. To do so it’s necessary to first identify the stakeholders, since they are the decision makers and will be asked for feedback in future steps of the method. In our problem the context of the analysis, will be the change’s scope, this means that the decision makers will be the stakeholders and the teams responsible for the implementation of the change process.

4.2 Identify Alternatives

After having the context of the problem analysed and its scope clarified, we need to identify the possible solutions being evaluated. Depending on the nature of the problem, these scenarios, may be already defined or may be generated in this step. In our problem the alternatives correspond to the possible To Be architecture scenarios.

All the scenarios must be described with the same level of detail and focus. This means using the same framework and architecture viewpoint for all scenarios, otherwise the score of the scenarios could be biased since not all the scenarios would have the same elements or information represented (Johnson et al, 2004).

4.3 Identify Criteria

In order to evaluate the different options, we must also identify the existing criteria. This process depends on the context where the analysis is being done and the selected approach (Blackburn and R. Valerdi, 2009):

- Top-Down: in this approach, criteria are structured in a hierarchical manner. This structure can be seen as a tree, where the main objectives are in the top and are successively detailed into more specific criteria.

- Bottom-Up: in this method, criteria are identified through an elicitation process, and then grouped in broader categories or objectives.

In our proposal, we will be using a Top-Down approach, starting by identifying the main broader scope objectives (Basili et al, 1994). Since our context is an organization’s enterprise architecture, more specifically during a change situation, one of the concerns is align the objectives of the change with the organization’s objectives. One way to achieve this is to look at the organization strategic map and scorecards in order to extract the high levels objectives of the organization.

4.3.1 Strategic Map and Balanced Scorecard

The Balanced Scorecard is a widely used, organization performance measurement tool, and it allows managers to keep track of the defined objectives, as well as measures used to evaluate those objectives (Kaplan and Norton, D. P., 2008). A typical scorecard will contain various objectives regarding different organization domains. These objectives can be from the financial domain, client / market domain or the organization development and learning domain. It’s a flexible approach allowing virtually, all types of organizations to represent their goals.

In order to make the link between the high level strategy and the objectives in the balanced scorecard, a strategic map can be used. This type of artifact shows the link between objectives, allowing the stakeholders to see the dependencies between objectives (Kaplan & Norton, D. P., 2008).

4.3.2 Metric Selection

Since objectives, are not normally directly measurable, in order to quantify them we must detail objectives into metrics, following the Top-Down approach described early. We will use the Goal Question Metric process (Basili et al, 1994). This methodology allows us to select a group of measurable metrics, that will evaluate the defined set of goals.

The process starts by identifying the goals, and in our case these goals correspond to the ones extracted from the strategic map and scorecard (V. Basili et al, 2007).

Secondly, stakeholders are asked to define questions, that when answered would allow them to be confident about the achievement of each objective. These questions will indicate what entities we need to measure, and what metrics should be used. The next step is to look at the proposed questions, and define metrics that allow us to give a quantitative answer to each of the questions. This process generates a tree, with goals on top that derive into questions and that in turn are linked to metrics. These goals and metrics are the
criteria we will be using in our proposed analysis to evaluate the existing scenarios.

4.4 Evaluate Scenarios

Having identified the available alternatives and the evaluation criteria, we must evaluate each scenario versus the identified set of criteria, in order to obtain the scenarios score in all criteria. Depending on the nature of the criteria, the evaluation may be different, going from counting elements in a given scenario’s architecture to subjective metrics like preference regarding some service provider. The usage of subjective metrics although possible must be limited, and whenever possible is better to choose a more objective metric.

If impact metrics have been selected, it is necessary to analyse the Archimate models, using the method proposed in section 3.

At the end of this step, the responsible for the analysis, must be in possession of each scenario’s scores.

4.5 Weight Criteria

Most of the choice problems analysed in real life do not have a single selection criterion, but multiple criteria as presented in multi-criteria analysis. But since not all criteria are equally important, some sort of compensation, must be applied so that a more important criteria, contributes more to the overall score than less important criteria.

To do this compensation there are several weighting methods available. In the next section we describe the selected method for weighting criteria, that can be integrated in a multi-criteria analysis (Dodgson et al, 2009).

4.5.1 Swing

The SWING method also requires generation of hypothetical alternatives, in this case only two, a Worst alternative (W), where all criteria have the lowest possible score and a Best alternative (B), where all criteria have the best possible score (Mustajoki, J. et al, 2005).

This method starts with the scenario W, and the stakeholders are asked which criterion they want to move first from W to B, and a value of 100 points is attributed to this criterion. Next they are asked which criterion they wish to move next from W to B and how much they value this transition comparing to the 100 points of the first choice. This last step is repeated for every criterion, and at the end we will have all the criteria weighted relatively to the most preferred criterion, in a normalized scale, since all weights are contained in the [0;100] interval.

4.5.2 Interval Swing

On weakness of the SWING method is the need to provide a single numeric value for each criteria, and although the weights are relative to a reference criteria, there may be uncertainty regarding one or more criteria weights.

The Swing interval method, is a variant of the original Swing method, and the main difference is to allow the presence of uncertainty in the analysis, this means instead of selecting a single value, there is the possibility of defining a value interval, representing the possible weight interval for a given criteria. Using intervals instead of single values, will change the results from a single score per scenario to an interval of possible scores.

Analysing the final score interval, is harder than just looking at single values, since there may be a change in scenarios preference, related to the weights change. In order to analyse the scores, one must use dominance operations in order to establish a ranking between the scenarios. In some cases it may be impossible to identify the best scenario, in all weight combination. In such cases the interval size must be reduced, requiring a reweight of the problem.

4.5.3 Selected Weighting Method

In our analysis we need each criterion individual weight, relatively to the rest of the set, in order to compute a global score combining the determined weights with the scenarios score obtained in the previous step, section 2.7.2. There are several weighting methods that can be used together with multicriteria analysis, in our proposal we will use SWING, due to its simplicity, the capacity to deal with large criteria number without adding to much complexity to the analysis and because it provides all its weights in a normalized scale that will facilitate computing the overall score.

The used of interval Swing is also advised, when in the presence of uncertainty, about the weights to use.
4.6 Decision and Sensitivity Analysis

Finally with the overall scores of the selected scenarios, it’s still necessary to test if the variation of certain weights causes a change in the preference rank of the scenarios. This is called a sensitivity analysis, and can help stakeholders to see the impact of their preferences and revise those same preferences. As so, it’s possible to return to a previous step in order to test different weights and their impact on the alternatives scores (Dodgson et al, 2009).

In the end of this analysis a consensus about the chosen scenario must be achieved, and that choice correctly validated according to the scores and preferences of the existing stakeholders.

5. TOOLS

In order to support the support and automatize, some of the steps and activities off the proposed method, some applications and scripts have been developed.

The impact rules, defined in section 3, can be automatically applied on enterprise architecture scenarios, modelled using Achimate, and the Aris Architect Enterprise Architecture tool. Through the usage of a script, the selected models are changed, in order to show the predicted impact. Another script that automatically computes the impact metrics result was also implemented.

In order to assist the weighting step of the methodology, the Goal Question Metric tree, can also be represented, and the final weights of the metrics extracted. Finally the communication of results, is also supported by an application integrated in Aris Mashzone. This tool, allows us to show the score of each scenarios and help in the decision making.

6. EXAMPLE

To illustrate the application of the proposed framework, we now give an example of its application. The example is a banking entity, which is considering two scenarios to implement, a change that hopefully will reduce their client’s exposure to credit risk.

Over the next sections we apply the proposed framework to this case in order to evaluate and support the decision of which scenario to implement.

6.1 Context Definition

The scope of the analysis is the bank’s “Debt Recovery” business process. This process is responsible for managing the operations of debt recovery whenever a client fails a due payment. Currently in the As Is scenario depicted in Error! A origem da referência não foi encontrada.4, the process is not supported by any application except, basic office tools like text and spreadsheet editors. When this process fails, meaning that the client wasn’t able to regulate his default situation, another process is triggered: the “Litigious Debt Recovery” process. This process is fully supported by a single application. This represents only a part of the bank’s complete enterprise architecture, but for our example it will be our focus.

The stakeholders responsible for the decision of selecting which scenario to choose are the current process owners, the project manager, and the teams allocated to the change process.

6.2 Scenario Identification

In the context of the example two alternatives are being studied. In the first alternative, a new application to support the two business processes is implemented.
deployed, substituting the existing application.

The second proposal is to deploy a new application that only supports the “Debt Recovery” process, illustrated Erro! A origem da referência não foi encontrada.5.

These scenarios are both modelled using Archimate modelling language.

6.3 Metric Selection

To select the metrics that will be used in scenario scoring, we first start by identifying what are the business goals of the bank and how they relate with the goals of this specific project.

To do this we must start by analysing the bank’s strategic map and scorecards. In this example let’s suppose the goals intended for the proposed change are:

- **Goal 1**: The “Debt Recovery” process must be simple in order to facilitate, training of new personnel;
- **Goal 2**: When adding the process’s support application, impact to the rest of the organization must be minimized;
- **Goal 3**: All process must have application support.

Having these goals identified we need to detail them to measurable metrics, in order to use them as criteria. This can be done by using GQM method presented in section 2.5.2.

According to this approach we must ask stakeholders to formulate questions, which when answered will allow them to tell if goals are being met. The questions obtained from stakeholders regarding the selected objectives are:

For goal 1:
- **Question 1**: How many activities are supported by applications?

For goal 2:
- **Question 5**: What roles are impacted by the change?
- **Question 6**: What processes are changed?

For goal 3:
- **Question 1**: How many activities are supported by applications?

It is possible using GQM that some questions are shared among the objectives. This happens in our example, due to the fact that some objectives are not independent. Using the questions, we must select metrics that allow us to answer these questions in a quantifiable way. The metrics can also be shared among questions, but in order to simplify the process we propose that a question is linked to a single metric, although according to GQM literature, is possible to have common metrics among the questions. The selected metrics are the following:

- **Metric 1**: Alignment between activities and applications;
- **Metric 2**: Required competencies;
- **Metric 3**: Impacted Business Roles Factor;
- **Metric 4**: Impacted Applications Factor;

The Goal Question Metric tree, obtained in this step is showed in Figure 6. Using the identified metrics we will compute in the next step, the scenarios score regarding these metrics.

6.4 Scenario Evaluation

In Table 1, are the results of the selected metrics. For a matter of simplification and since the focus of
the example it’s not the metrics application, we simply provide each scenario result.

Table 1: Individual metrics result.

<table>
<thead>
<tr>
<th>Metric</th>
<th>As Is</th>
<th>To be 1</th>
<th>To be 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>M1</td>
<td>0.454</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>M2</td>
<td>0.5</td>
<td>0.82</td>
<td>0.818</td>
</tr>
<tr>
<td>M3</td>
<td>0.333</td>
<td>0.333</td>
<td>0.333</td>
</tr>
<tr>
<td>M4</td>
<td>0.333</td>
<td>0.333</td>
<td>0.333</td>
</tr>
</tbody>
</table>

6.5 Metric Weighting

By applying the SWING methodology described in section 2.7, we obtain the weights for each objective.

We decided to ask stakeholders the objectives weights instead of metrics, because it’s easier for the stakeholders to operate with objectives, the communication is facilitated and the meaning of the weight is better understood.

Table 2: Goals weight.

<table>
<thead>
<tr>
<th>Weight</th>
<th>Goal 1</th>
<th>Goal 2</th>
<th>Goal 3</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>SWING</td>
<td>80</td>
<td>20</td>
<td>100</td>
<td>200</td>
</tr>
<tr>
<td>[0;100]</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SWING</td>
<td>0.4</td>
<td>0.1</td>
<td>0.5</td>
<td>1</td>
</tr>
<tr>
<td>[0;1]</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Through an additive model it’s easy to transform the given weights into metrics weights in the next table the weights for metrics are showed.

Table 3: Metrics Weight.

<table>
<thead>
<tr>
<th>Metric</th>
<th>Weight Swing</th>
</tr>
</thead>
<tbody>
<tr>
<td>M1</td>
<td>0.2</td>
</tr>
<tr>
<td>M2</td>
<td>0.7</td>
</tr>
<tr>
<td>M3</td>
<td>0.05</td>
</tr>
<tr>
<td>M4</td>
<td>0.05</td>
</tr>
<tr>
<td>Total</td>
<td>1</td>
</tr>
</tbody>
</table>

6.6 Scenario Comparison

Having the scores of each scenario and the weight of all the metrics, we are able to calculate the global result of each scenario using a simple summation:

\[ V(a) = \sum_i w_i v_i(a) \]  

The above formula represents a widely used additive model. In this expression, \( w_i \) is the weight associated with criterion \( i \), and \( v_i(a) \) is the score of alternative \( a \), in criterion \( i \). The final result \( V(a) \) is the overall score of the alternative \( a \), in all criteria.

By applying this formula to every scenario, we obtain the global scores present in Figure 8.

![Figure 7: Global results](image)

6.7 Decision

It’s the final step of the proposed analysis, where the stakeholders select the scenario to implement, they may accept the proposed scenario, re-weight the criteria, or do a sensitivity analysis regarding some of the criteria. In our example we will show how global results are affected by changing the weight of objective 2, suppose a stakeholder, wants to see what would be the results if, goal 2 weight increases from 0,1 to 0,4.

![Figure 9: Global scores after re-weighting](image)

When analysing the graph in Figure 9, the scores obtained without weighting are the same as before, because the metrics result remained unchanged, but when we analyse the results...
obtained using the weighs, it’s clear that the alternatives rank have changed, and the As Is scenario becomes preferable to scenario To be 1.

This happened because the weight given to goal 2, which relates with the effort required to change the architecture is now bigger, penalizing scenario To Be 1 and To Be 2, which involve changing elements to implement the new features required in the organization.

This example demonstrates how important weight is in the proposed analysis, and how careful one must be when assigning weights, since the alternatives rank may suffer a severe change just by re-weighting a single criterion.

7 CRITICAL ANALYSIS

The multi-criteria analysis is a solid proved method, for structuring and conducting an evaluation over multiple alternatives, when there are also multiple criteria. Our objective is to apply it to the domain of enterprise architecture evaluation, due to its capability to adapt to diverse domains and formalize the evaluation process.

The process allows stakeholders to understand the impacts of their choices, but also justify those same choices facilitating the decision making process and communication among them.

Selection of metrics from goals using Goal Question Metric, as we propose on this paper, is a different approach from the one proposed in (Vasconcelos, A. et al, 2005), where metrics are associated with quality attributes. The later approach is derived from software evaluation methods.

Since there is still not so much work done in defining a set of general enterprise architecture quality attributes, we use the goal based metric selection. This approach is more flexible, and applicable to a broader set of metrics not limited to quality attributes scope.

Regarding the impact rules, they allowed us to have a view of the impact propagated through the elements of enterprise architecture, when applied to more complex architectures and impact situations, some problems regarding, decision of which impact to propagate may occur. We decided to always, propagate the situation that generates the most impact, this option may tend to overestimate real impact.

The scripts and tools developed to assist the analysis, helped at speeding up the analysis and preventing human mistakes in impact rules application and metrics computation.

The weighting of criteria, is an essential step in the proposed evaluation, since it can drastically change the results. Other weighting method could be used, without consequences to the analysis, but given the simplicity, versatility and stakeholder involvement in SWING method, we suggest the usage of this method over other more complex approaches.

8 CONCLUSIONS

In this work we proposed an enterprise architecture evaluation framework that applies to a common organization situation that is the selection of a future To-Be scenario, in order to implement some new function or respond to another change situation. We have already applied this framework in real world test cases in order to validate it, with some satisfactory results.

The main goal, that this framework contributes to formalize and facilitate the problem of scenario selection, was archived. Also the change impact rules, used in the test cases, were able to correctly predict and quantify the change impact present in the different scenarios.

9 FUTURE WORK

The framework proposed in this work is currently in progress, so there are some points where it can be improved and extended. First regarding the metric selection, here we propose using Goal Question Metric, since its ability to select metrics in various domains, like software and non-software domains has been proved. It also helps at keeping the metrics aligned with the objectives.

But other metrics selection methods or even a pre-defined metrics set could be used. A related future work would be the creation of a metrics library, where metrics were associated with some objective or objective type, and given a particular objective, one could simple search the library for the related metrics and apply them.

An alternative to this could be the definition of quality attributes in enterprise architecture, similar to the ones found in the software domain, and given a quality attribute we would have a set of metrics that measure that attribute.

The impact change analysis presented, is limited to Archimate based models, one possible improvement is extend the rules and tools, to other enterprise architecture modelling languages.
Other area that could be improved is the alternative identification step. Since our domain is enterprise architecture, developing a tool for scenario generation based on As Is scenario and a set of parameters would be an important improvement.

REFERENCES


