Enterprise Architecture Projects and Goals alignment assessment

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Abstract Although the alignment between organization projects and strategic objectives is a central competence for managing organizations, there aren’t available approaches to support this need in the enterprise engineering discipline. Since projects can be specified and implemented to meet specific strategic objectives, its implementation is expected to have an impact in the enterprise architecture, contributing or making harder to achieve the strategic objectives. Enterprise architecture existing approaches are expected to support the organization’s evolution from a current state to a future one. Although some researches address the identification of the alignment between projects and strategic objectives, the measurement and quantification of this architectural alignment, considering the information system architecture quality attributes, is not usually considered when defining or implementing projects. This paper contributes to filling this gap by extending ArchiMate enterprise architecture framework and proposing a 4-step approach for assessing the alignment between enterprise projects and goals: i) Identify the alignment between projects and strategic objectives; ii) Identify the quality attributes derived from the strategic objectives; iii) Identify applicable metrics to projects’ architecture; iv) Quantify the alignment level between projects and strategic objectives. With this research, we provide enterprise architecture discipline and organizations an approach that supports the assessment and improvement of strategies and projects portfolios misalignments. The approach developed is applied to a government-owned company. The results show that it is possible to use EA in supporting decision-making and in selecting projects that have higher impact on the company’s strategy.

Keywords — alignment, strategic objectives, enterprise architecture, ArchiMate, projects, quality attribute, architecture assessment.

I. INTRODUCTION

This chapter introduces the alignment challenge. Firstly, the main goal of this dissertation is described, followed by the research methodology, the research problem and the possible applications of this work. Finally, we describe the outline of the document.

For business success, organizations must master the definition and implementation of their strategies. However, the best strategies can be useless without the proper implementation [1]. When formulating the organization’s strategy, Quiros [2] highlighted the importance of the organizational alignment. Organizational alignment requires the knowledge about the organization’s goals and objectives [3]. Projects must add value to organizations and the expected return on investment. It is consensual to consider a project complete when delivered within time and with the budget stipulated. Projects tend to have a weak alignment with the business strategy because most of them were conceived to solve urgencies in operations or to answer to senior managers’ specific requirements [9], [3], [4]. There are many models of business strategy, for instance: balanced scorecard, and business motivation model [5], [6]. Few of them define project initiatives. Additionally, there is no balance in the project portfolio based on the alignment with business strategy. This misalignment results in weak strategy execution.

Enterprise architecture (EA) provides the insight needed to translate corporate strategy into daily operations. EA provides a path between strategy and execution. It allows understanding how projects help to achieve the organization’s strategic objectives [7].

To measure the alignment level between the organization’s projects and strategic objectives, we will use ArchiMate and EA. ArchiMate is the standard language for the modelling of EA. It also enables enterprise architects to describe, analyze and visualize the relationships among business domains in an unambiguous way [8]. This research will help organizations to quantify the alignment between their projects and strategic objectives, in order to efficiently manage their resources and focus.

The methodology applied in this research is the Design Science Research Methodology (DSRM). This method solves the domain problem and has six steps: problem
identification, goal setting, design and development, demonstration, evaluation and communication [9]. DSRM aims to create and evaluate technological artefacts to solve organizational problems. Such artefacts include constructors (vocabulary and symbols), models (abstractions and representations), methods (algorithms and practices), and instances (implemented and prototypes).

This methodology is the most adequate for this research because it aligns the proactivity in the solution design and the organizational context.

Section 2 describes the related work that identifies crucial concepts to the definition of the proposed solution. Section 3 presents our solution to quantify the alignment between projects and the strategic objectives. It consists in a four steps method: i) identification of the alignment between an organization’s projects and its strategic objectives, ii) identification of the quality attributes associated to the strategic objectives, iii) identification of applicable metrics to measure the quality attributes in the project architecture and iv) quantification of the alignment between the projects and strategic objectives. Section 4 proves our proposed solution in a government-owned company, named Democorp. Section 5 provides the conclusions of our work.

II. RELATED WORK

A. Enterprise Architecture

There are many definitions for EA concept According to Institute of Electronics and Electronics Engineers: "An Architecture is the fundamental organization of a system embodied in its components, their relationships with each other, to the environment, and the principles guiding its design and evolution." [10]. The Open Group’s Architectural Framework (TOGAF) defines EA: "the purpose of EA is to optimize across the enterprise the often-fragmented legacy of processes (both manual and automated) into the integrated environment that is responsive to change and supportive of the delivery of the business strategy. (...) providing a strategic context for the evolution and reach of digital capability in response to the constantly changing needs of the business environment." [11]. The ArchiMate Foundation defines EA: "A coherent whole of principles, methods, and models used in the design and realization of an enterprise's organizational structure, business processes, information systems, and infrastructure." [12].

The variety in these definitions indicates that the field of enterprise architecture is still in its infancy. However, all these definitions have a standard reference to structure and relationships combined regarding a set of governing principles that provide guidance and support for directions and decisions. EA focuses on shaping and governing the design of the future enterprise using principles to stipulate future direction and models to visualize future states [13].

To our research’s purpose, EA is a coherent whole of principles, methods, and models used in the design and realization of an enterprise’s organizational structure, business processes, information systems, and infrastructure [12].

B. FCEO

Framework CEO is a framework that allows to model organizational concepts defined. Goals are considered business objects, for the strategy; processes, for the business processes modeling; resources, for the business resources modeling; and extended components, for the information systems modeling. FCEO supports two levels - Business and Information Systems and Technologies (TSI) - and several sub-levels:

At business, there are three sub-levels: Strategy - Described through business objectives. These goals can be achieved by completing one or more business processes; Business processes - has to meet one or more objectives and interact with the various entities to give a better performance of the work; Entities - handled by business processes and represent all the relevant concepts in a specific business context.

At information systems and technologies (TSI), FCEO defines two sub-levels: At the application level, SI is defined by a set of components whose main purpose is to support business processes and ensure that information entities are available. At the technological level, the primary goal is the specification of the technologies and infrastructures which allow the implementation of the application components defined at the higher level.

This framework is supported and formalized in UML. FCEO’s primitives have attributes that allow the characterization of the architecture and inference on architectural quality characteristics. It is possible to identify a global set of quality attributes to analyze an architecture (e.g. reliability, safety, alignment). Still, we decide not to use this framework because it presents a set of limitations that in our view prevents us from following this option: It does not identify perspectives (proposed measure in the IEEE 1470 standard). Does not define primitives or constrains attributes for the Architecture specification at the application or technology level. Does not define an approach or method that guides the design, evaluation and construction of the architecture aligned with the business [14].

C. ArchiMate

ArchiMate is a modelling language for EA that provides helping mechanisms for architects to build models to describe the organization’s structure and obtain different views (viewpoints) according to the stakeholders [8],[14]. The essential elements of ArchiMate are: active structure, passive structure, and behaviour element. Active structure elements can perform some action and behaviour. The passive structure is the elements where the active elements perform their actions and behaviours. The behaviour elements are actions and behaviours which active elements perform [8].

The Open Group [8] split ArchiMate into three layers: i) Business, where business processes and their actors are defined, ii) Application, services that support business processes and applications that perform them. iii) Technological, technological services, such as processing, storage, and required communication services to run applications. The Open Group added Physical elements to model physical equipment, materials, and distributed networks for this layer.
Despite the core aspect, there are two more in the ArchiMate 3.0.1: motivation and migration and Implementation. The motivation’s extension is used to model the motivations or reasons that guide the design or change of EA. It has the following concepts: meaning, value, driver, assessment, goal, outcome, principle, requirement and constraint. Whereas, migration and implementation extension include concepts for modelling implementation programs, projects to support program, portfolio, and project management, and a plateau concept to support migration planning [8]. ArchiMate allows us to add attributes to its elements with a name and associated value [15]. In this research, we model the strategic elements and the projects’ EA of an organization to validate our solution.

### D. Metrics

According to Vasconcelos, Sousa and Tribolet [14], the term measure is a process by which numbers, i.e. metrics, are assigned to real-world entities to characterize their quality attributes through clearly defined rules. The authors describe the metric as a quantitative reality interpretation, based on observable measures of an architecture.

There are no consolidated metrics to measure information systems architectures, but extensions to measure the quality attributes of software architectures [16]. We use the metrics proposed by Vasconcelos, Sousa, and Tribolet [14] based on case studies [18]. These metrics were proposed to be applied in FCEO (Organizational Engineering Center Framework for modelling information systems architecture). A framework which allows to model organizational concepts, supported in UML (Unified Modelling Language).

Regarding our choice of using ArchiMate as the modelling language, we study the possibility of adapting or taking advantage of those metrics. As stated in section 2.3, we focus on the three architectural levels: Business, Application and Technology. We follow a set of nine principles to guarantee the consolidation of metrics, for the information systems evaluation [14]. Next, we select the metrics attending our research’ scope – table 1.

<table>
<thead>
<tr>
<th>Quality</th>
<th>Sub-quality</th>
<th>Metric</th>
<th>Architectural level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Functionality</td>
<td>Adequacy</td>
<td>BSRPF – business service factor required and made available</td>
<td>Business and application</td>
</tr>
<tr>
<td></td>
<td>Interoperability</td>
<td>DTISSF – the factor of technologies in which IS services are made available</td>
<td>Application and technology</td>
</tr>
<tr>
<td></td>
<td>Security</td>
<td>SCBITABF – the factor of security components between IT application block</td>
<td>Technological</td>
</tr>
</tbody>
</table>

As table 1 illustrates, we do not consider information level metrics. Our solution only focuses on business, application and technology level.

### III. Proposal

We propose to determine the alignment level between projects and strategic objectives. Inês Garcia [3] argues that there is a dependent relationship between projects and the implemented strategy. It is possible to quantify what each project contributes to the strategy. Therefore, we analyze the projects of an organization and assess their impact on the strategy, becoming possible to understand if the path of the organization tends to go is the correct one or not. We use the following ArchiMate viewpoints to support our proposal: outcome realization viewpoint, motivation viewpoint and a proposed generic viewpoint. The concepts in motivation viewpoint allow us to have a perception of the company’s motivation [3], [8]. Whereas, those in outcome realization viewpoint allow us to get an overview of the organization’s architecture and its outcomes. It can also represent all the layers of the architecture in a single diagram and used as a support for impact analysis against changes in EA, including dependencies between layers [8].

We propose to merge both viewpoints and create a generic one, whose goal is to support and measure the alignment
following a method based on the next four steps: i) identify the alignment between projects and strategic objectives; ii) identify quality attributes associated with strategic objectives; iii) identify applicable metrics to projects’ architecture; iv) quantify the alignment level between projects and the strategic objectives. Figure 1 provides the big picture of our solution, including inputs and outputs of each process.

**Figure 1 - Solution's macro processes**

1) **Step 1 - Identify the alignment between projects and strategic objectives.**

At this stage, we aim to identify the alignment between projects and strategic objectives. For this, we follow the steps present on the next sections: 1) Identify the strategic objectives; 2) Represent objectives’ outcomes and expected values; 3) Represent projects and their expected values; 4) Identify projects aligned with the organization’s strategic objectives.

a) **Represent objectives’ outcomes and expected values**

Value is a motivational element that denotes the relative utility, or importance of a core element or an outcome. The value represents the importance of the strategic objective to the organization. This value can be identified from the analysis of documentation regarding the organization’s strategy, namely, the definition of strategic objectives and strategic orientations.

To model the objectives’ outcomes and expected values, we use a generic template (Figure 2) already proposed, using ArchiMate as the modelling language [3].

**Figure 2 - Generic template to model outcome’s expected values.**

b) **Represent projects and their expected values**

In this step, we analyze projects’ documentation and represent their architecture and their expected value to the company. We do not consider projects without information concerning its scope, purpose or project owners and that are unable to identify its processes, services, application components, outcomes, expected values.

We use the outcome realization viewpoint to model the organization's projects, its processes, stakeholders, services, outcomes, expected values. ArchiMate also allows us to represent the properties or attributes of each element that we will use for the metric application [15].

Inês Garcia [3] identified the alignment between the projects and strategic objectives at motivational, implementation and migration level. It is a good starting point but that is not enough. We aim to measure the impact of the projects’ architectures on the organization’s strategy.

c) **Identify projects aligned with the organization’s strategic objectives**

We propose a generic viewpoint to the alignment between projects and strategic objectives.

**Figure 3 - Generic viewpoint to model the alignment between projects and strategic objectives.**

Every project has an outcome expected value to the organization (output of the previous step), defined according to a business rule: It is obligatory that each outcome value is defined by precisely one transitive verb followed by the direct object that complements the verb [3]. Every strategic objective has an outcome expected value, which is also defined according to that business rule. If the value that a project brings to the organization is similar to the outcome value defined for each strategic objective, then both values are in line and, consequently, that project is aligned with that strategic objective.

If a project value does not correspond in any way to a strategic objective outcome value, there is no alignment.

2) **Step 2 - Identify quality attributes associated with strategic objectives.**

In this step, we identify the quality attributes associated with strategic objectives.

We seek to identify and model those quality attributes after analyzing documentation of organization's strategy, which compiles the objectives, mission, vision, values and strategic analysis of its products, customers and business in general.

Also, we suggest reaching a consensus with one or more stakeholders to understand which quality attributes interfere with the objectives’ achievement, as this research’s purpose is to measure the alignment and not to derive quality attributes.

Each quality attribute has a weight associated that represents its relevance to the strategic objective – real type value between 0 and 9. Moreover, each strategic objective also has an importance value to the company – real type value.
between 0 and 9. The organization’s stakeholders define these values.

3) Step 3 - Identify applicable metrics to projects’ architecture.

Given the quality attributes, we aim to identify appropriate metrics to measure them in the projects’ architecture. These metrics must be measurable and unambiguous in the architecture. We will consider metrics that have already been formalized by [14] to evaluate a project architecture. Since these metrics were formalized in FCEO, we propose to map them into ArchiMate. The proposed metrics are organized according to the quality attributes desired for EA. This research proposes 12 metrics for EA evaluation to quantify the set of quality attributes. Each metric is focused at a defined architectural level (business, application or technology). The metrics are next described, according to the quality attribute assessed.

(1) Functionality metrics

**BSRPF – Business Service Required and Provided Factor**

**Computation**

\[
BSRPF = 1 - \frac{\text{#Business service \压迫\text{RNI}_i}}{\text{#Business service \压迫Node}_i}, \text{where}
\]

#Business service RNI_i - number of business services required to support the process i and not implemented

#Business service R_i - number of business services required to support the process i

#Business process – number of business processes

**DTISSF – Distinct Technologies for IS Services Factor**

**Computation**

\[
DTISSF = 1 - \frac{\text{#application services}}{\sum_{i=1}^{\text{#technology service}} \text{technology service}_{\text{integration} i}}, \text{where}
\]

#technology service_{integration} i - number of technology services, where service 'technology' attribute = “Integration Service”

#application service – number of application services

**SCBITABF – Security Components Between IT Application Block Factor**

**Computation**

\[
SCBITABF = \frac{\sum_{i=1}^{\text{#System Software}} \text{MIN}([\text{#SITB}_j])}{\text{#System Software} \times \text{#Node}}, \text{where}
\]

MIN([#SITB]) – minimum number of Node with securityElement = TRUE in the connection between two Nodes

#Node – number of Node elements

#System Software – number of system software elements

(2) Reliability metrics

**ITRF – IT Redundancy Factor**

**Computation**

\[
ITRF = \frac{\text{#Technology Elements} - \text{#redundantElements}}{\text{#Technology Elements}}, \text{where}
\]

#redundantElements – number of nodes whose redundantElement attribute value = True

#Technology Elements – number of nodes

(3) Efficiency metrics

**SITPLBF – Stateful IT Presentation Block and IT Logic Block Factor**

**Computation**

\[
SITPLBF = 1 - \frac{\text{#SIT}}{\text{#IT}}, \text{where}
\]

#SIT – number of IT elements where the attribute state = TRUE

#IT – number of IT elements

(4) Maintainability metrics

**SCCF – Service Cyclomatic Complexity Factor**

**Computation**

\[
SCCF = \frac{\text{#business service} + \text{#application service}}{\sum_{i=1}^{\text{#business service} + \text{#application service}} |e_i - n_i + 2|}, \text{where}
\]

#business service – number of business services

#application service – number of application services

\(e_i\) – dependencies number between application component and service i

\(n_i\) – number of application components that supports service i

**NOISF – Number of operations in IS Block Factor**

**Computation**

\[
NOISF = \frac{\text{#application component}}{\sum_{i=1}^{\text{#business service} \times \text{application component} i}}, \text{where}
\]

#business service application component i – number of business services at application component i

#application component – number of application components

**RSF – Response for a Service Factor**

**Computation**

\[
RSF = \frac{\text{#business service} + \text{#application service}}{\sum_{i=1}^{\text{#business service} + \text{#application service}} \text{application component} i}
\]
where

- \#business service – number of business services
- \#application service – number of application services
- \#application component \(i\) – number of application component that supports the service \(i\)

(5) Portability metrics

**POSF – Possible Operating Systems Factor**

Computing

\[
POSF = 1 - \frac{\text{\#system software}}{\sum_{i=1} \text{\#system software}, \text{\#nodes}}, \text{where}
\]

\(\text{\#system software}\) – number of system software
\(\text{\#nodes}\) – number of nodes

(6) Architectural alignment metrics

**CPSMF – Critical Process System Mismatch Factor**

Computing

\[
CPSMF = 1 - \frac{\#\{P \in AC \cap NC\} + \#\{PNC \in AC\}}{\#P}, \text{where}
\]

\(\#\{P \in AC\}\) – is the number of critical processes supported in application components that support other non-critical processes
\(\#\{PNC \in AC\}\) – is the number of non-critical processes supported in application components that support other critical processes
\(\#P\) – number of processes

**CSTMF – Critical Process Technology Mismatch Factor**

Computing

\[
CSTMF = 1 - \frac{\#\{AC \in node NC\} + \#\{AC NC \in node C\}}{\#\text{application component}}, \text{where}
\]

\(\#\{AC \in node NC\}\) – is the number of application components considered critical supported on nodes that support other application components besides the critical ones (one application component is considered critical when it only supports critical processes)
\(\#\{AC NC \in node C\}\) – is the number of non-critical application components supported on nodes that support other non-critical application components
\(\#\text{application component}\) – number of application components

(7) Dimension metrics

**NA – number of applications**

**Computation**

\(\text{NA} = \#\text{application components}, \text{where}\)

\(\#\text{application components}\) – number of application components

**NITB – number of IT Blocks**

**Computation**

\(\text{NITB} = \#\text{nodes}\)

Where:

\(\#\text{nodes}\) – number of nodes

4) **Step 4 - Quantify the alignment level between projects and the strategic objectives.**

As we want to measure alignment level between projects and strategic objectives, we need to get the project’s impact according to quality attributes’ value and weighting. Those values are the metrics’ result from the previous steps. For this reason, we propose an arithmetic formula to quantify the alignment level:

\[
\sum_{i=1}^{n} \text{weighting} \cdot \left( \sum_{j=1}^{m} \text{metric value} \right) \leq 1
\]

\(n = \text{objectives}\)
\(m = \text{quality attributes}\)

For each quality is assigned a weighting that means the importance value into the strategic objective. The strategic objective’s value means the importance value to the organization.

IV. **Demonstration**

This section aims to prove the usefulness of artefacts to solve one or more instances of the problem. We apply our solution to a government-owned company that for confidentiality reasons we named “Democorp”. To better address the problem and demonstrate the proposed solution, we selected two projects from the portfolio: **Employee’s card project**. We expect to compare two possible TO-BEs of each project and study which one has a higher impact on the Democorp’s strategy. The project’s goal is to customize an employee card. With Democorp’s strategic plan, we were able to identify strategic objectives and its outcomes.

Our goal was to decide which alternative architectures (TO-BE) is better aligned with the strategic objectives. The solution comprises of four methodological steps: 1) Identify the alignment between projects and strategic objectives; 2) Identify quality attributes associated with strategic objectives; 3) Identify metrics which can be applied; 4) Quantify the alignment level between projects and strategic objectives.

1) **Step 1 – Identify the alignment between projects and strategic objectives**

To identify the alignment between the selected project and strategic objectives, it was imperative to:

a) **Identify organization’s strategic objectives**

The strategy definition of Democorp started by clarifying its mission and vision statements. These concepts are essential to the strategic plan, where strategic orientations and strategic objectives are also defined. The first tries to ensure
the sustainability of the company’s activity and the creation of long-term value. The second potentiates and measures the achievement of strategic orientations and are the basis for the operational objectives’ definition.

We were able to identify its mission, vision and core values. These elements help stakeholders to define strategic orientations, strategic objectives, and respective elements. We identified seven Democorp’s strategic orientations, twenty-one strategic objectives, and its outcomes. Each strategic orientation is numbered (from 1 to 7) and has strategic objectives associated (numbered from 1.1 to 7.3, according with the strategic orientation).

In Figure 4, we modelled the association between strategic orientations, strategic objectives and its outcomes.

Projects do not meet one strategic objective but contribute for its achievement. We used the above strategic objectives as input for the next step.

b) Represent objectives’ outcomes and expected values

In this step, we analyzed the documentation of Democorp’s strategy, namely strategic objectives and outcomes, to identify the expected value to the company. The value element represents the importance of the outcome and strategic objective to the organization. To represent the outcome value, we followed the business rule proposed by [3], using a transitive verb and a direct object that complements it.

We modeled the Democorp’s objectives outcomes and their expected value, using the motivation viewpoint proposed in section 1.1.1.
In the Figure 6, we have identified the strategic objectives’ expected values according to the business rule defined in section 1.1.1.

c) Represent projects and their expected values

In this step, we analyzed documentation about the scope and purpose of the project to identify the most critical processes, applications they depend on, stakeholders, services, and their expected outcome value to Democorp. We used the outcome realization viewpoint to model it, as proposed in section III.1)b). This viewpoint shows how underlying core elements produce business – oriented results [8].

Employees’ card TO-BE 1

Figure 8 – Employee’s card TO-BE 1

Figure 8 describes the employee’s card customization TO-BE 1. After receiving a request, the production process starts: validating employee’s data and printing card. Then, verifying the employee’s identity and, later, proceed to the customization itself. The outcome of this implementation is to increase response to failures, adding a specific value to the company: optimize process and infrastructure.

We added attributes to the Employee's card TO-BE 1 elements for further measurement. Those attributes are represented in the following table.

<table>
<thead>
<tr>
<th>Table 1 - Employee's card TO-BE 1 attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Element</td>
</tr>
<tr>
<td>Production</td>
</tr>
<tr>
<td>Customization</td>
</tr>
<tr>
<td>Produce card</td>
</tr>
<tr>
<td>Customize card</td>
</tr>
<tr>
<td>Database</td>
</tr>
<tr>
<td>Network</td>
</tr>
<tr>
<td>Server</td>
</tr>
</tbody>
</table>

Employees’ card TO-BE 2

Figure 9 - Employee's card TO-BE 2

Figure 9 describes employee’s card customization TO-BE 2. The objective of this implementation was to deploy an alternate site datacenter with asynchronous system replication. In this way, any type of disruption that affects only one of the locations will not affect the continuity in the reception of requests.

The attributes of Employee's card TO-BE 2 elements are described in the following table.

<table>
<thead>
<tr>
<th>Table 2- Employee's card TO-BE 2 attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Element</td>
</tr>
<tr>
<td>Production</td>
</tr>
<tr>
<td>Customization</td>
</tr>
<tr>
<td>Produce card</td>
</tr>
<tr>
<td>Customize card</td>
</tr>
<tr>
<td>Database</td>
</tr>
<tr>
<td>Network</td>
</tr>
<tr>
<td>Server</td>
</tr>
<tr>
<td>Server Interface</td>
</tr>
</tbody>
</table>
d) Identify projects aligned with the organization’s strategic objectives

In this step, we identified the alignment between the selected project and the strategic objectives. The project expected outcome value to Democorp can be in line with outcome’s value associated with a strategic objective. By analyzing and comparing both values, we can identify the alignment between a specific project and strategic objectives.

Figure 12 provides the alignment between employee’s card TO-BE 1 and one strategic objective.

![Figure 12](image1.png)

Figure 10 - Alignment between employee’s card TO-BE 1 and one strategic objective.

The project’s value is to optimize process and infrastructure and it is in line with the optimize process and infrastructure, that it is the value of the strategic objective.

Figure 13 provides the alignment between employee’s card TO-BE 2 and the same strategic objective. It is an improvement of the actual state (TO-BE 1) by adding security mechanisms and redundant elements.

![Figure 13](image2.png)

Figure 11 - Alignment between the second employee’s card TO-BE 2 and strategic objective

2) Step 2 – Identify quality attributes associated with strategic objectives

In this step, we met with strategic objectives’ creators to understand which quality attributes we could derive from the strategic objectives. With quality attributes, it becomes possible to measure the project’s impact on the company’s strategy. Since our research’s scope is to measure the alignment between projects and strategic objectives, we do not consider strategic objectives that do not have any quality attribute associated and are not in line with a project.

After applying step 1, we gathered one strategic objectives that are in line with the project: rationalize and optimize the structure.

As the objectives is to rationalize and optimize the structure, the creator considered significant the efficiency in the employee’s card customization processes and applications. We came up with two measurable quality attributes in the architecture: Business/application alignment and fault tolerance.

We also needed to get the importance of the strategic objective and quality attributes associated. The strategic objective’s importance is a quantitative value between 0 and 10 for the organization’s significance and the quality attribute importance is also a quantitative value between 0 and 10 but for the strategic objective significance. Strategic objectives’ creator defined a similar importance for every strategic objective. Assuming that the importance of fault tolerance is higher than business and application alignment for rationalize and optimize the structure, we propose the following importance distribution.

Table 3 - Mapping strategic objectives and quality attributes

<table>
<thead>
<tr>
<th>Strategic objective</th>
<th>Importance (0-10)</th>
<th>Quality attribute</th>
<th>Importance (0-10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rationalize and optimize the structure</td>
<td>5</td>
<td>Business and application alignment</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fault tolerance</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fault Tolerance</td>
<td>5</td>
</tr>
</tbody>
</table>

3) Step 3 - Identify applicable metrics to projects’ architecture

In this step, we identified metrics in the correct condition to measure the quality attributes defined in step 2. The quality attributes that resulted from the previous step are: business and application alignment, fault tolerance and scalability. Consequently, we gathered metrics that allow us to measure these quality attributes in the architectures and to get deviations from TO-BE 1 and TO-BE 2.

Table 4 - Metrics to measure quality attributes

<table>
<thead>
<tr>
<th>Quality attribute</th>
<th>Metric</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business/application alignment</td>
<td>Alignment heuristics</td>
</tr>
<tr>
<td>Fault tolerance</td>
<td>ITRF</td>
</tr>
</tbody>
</table>
Scalability | SITPLBF
---|---
The metrics in table 11 were formalized in FCEO [17], but we proposed to adapt them into ArchiMate helping us to apply our solution, as explained in section 3.

4) **Step 4 – Quantify the alignment level between projects and the strategic objectives**

In this step, we quantified the alignment level between the possible implementations (TO-BEs) of projects and the strategic objectives considered before. First, we needed to calculate the value of the metrics identified in the previous step.

**Employee’s card TO-BE 1**

For business and application alignment, we applied the CPSMF metric:

$$CPSMF = 1 - \frac{1 + 0}{2} = 0.5$$

For fault tolerance, we applied the ITRF metric:

$$ITRF = \frac{0}{5} = 0$$

**Employee’s card TO-BE 2**

For business and application alignment, we applied the CPSMF metric:

$$CPSMF = 1 - \frac{0 + 0}{2} = 1$$

For fault tolerance, we applied the ITRF metric:

$$ITRF = \frac{2}{9} = 0.22$$

Then, we applied the contribution formula (2) to quantify the alignment level between projects and the strategic objectives:

**Employee’s card TO-BE 1**

$$c = 0.5 \times (0.5 \times 0.5 + 0 \times 0.5) = 0.125$$

**Employee’s card TO-BE 2**

$$c = 0.5 \times (1 \times 0.5 + 0.22 \times 0.5) = 0.305$$

Thus, the employee’s card TO-BE 2 has a greater impact on the strategic objectives of the organization than TO-BE 1, regarding the quality attributes measured in both TO-BEs.

V. **Conclusions**

The alignment between projects with organization’s strategy is crucial in today’s competitive market. Without the right projects, even the most prepared strategies can fail. Organizations use strategy models, templates, frameworks tools to analyze strategies, goals and objectives, based on KPI’s. These tools only measure whether strategic objectives are accomplished or not. Left apart initiatives that can contribute for it.

The related work provided information concerning key concepts relevant to the research problem, such as: organizational alignment, enterprise architecture, key to model the proposed solution.

Enterprise architecture offers different perspectives of the organization’s AS-IS and TO-BE and operations that must be executed to meet the strategic objectives. Also, it provides different viewpoints that focus on specific aspects of the architecture, allowing to represent our proposed solution in a coherent way.

Our proposed solution was applied in Democorp, a government-owned company. We modelled Democorp’s strategic elements and one project and the expected value of a project using ArchiMate as the modelling language. Additionally, we identified the correlation between Democorp’s projects architecture and its strategic objectives. We provided an arithmetic solution to quantify such alignment.

It was possible to conclude that proposed solution helped Democorp to identify which projects could contribute the most to the achievement of the strategic objectives.

**References**