

# **Alignment between Organization Projects and Strategic Objectives**

Inês Cunha Garcia

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**Information Systems and Computer Engineering**

## **Examination Committee**

Chairperson: Prof. António Manuel Ferreira Rito da Silva

Supervisor: Prof. André Ferreira Ferrão Couto e Vasconcelos

Member of the Committee: Prof. Alberto Manuel Rodrigues da Silva

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# Resumo

Durante o processo de definição estratégica, investigadores sublinham a importância do alinhamento organizacional, sendo esta uma das principais preocupações das organizações. Divulgar elementos estratégicos como visão, missão e objetivos, torná-los perceptíveis e ao alcance de todos os colaboradores da empresa, permite alinhar o trabalho realizado diariamente com os objetivos da organização.

Para algumas organizações, o facto de terem objetivos estratégicos definidos e respetivas métricas associadas é o suficiente para que a definição da estratégia esteja completa. No entanto, sem as ferramentas necessárias para a implementação adequada da estratégia definida e respetiva adaptação ao contexto empresarial, torna-se mais difícil sobreviver à competitividade do mercado.

Estratégia e projetos devem ser dois conceitos relacionáveis. A maioria dos projetos são desenvolvidos no âmbito da criação de novos produtos, implementação de requisitos necessários ao negócio e até para dar resposta a urgências. Esses motivos levam à realização de projetos e o resultado final pode ou não estar em linha com os objetivos estratégicos definidos. Encontrar o alinhamento entre os objetivos estratégicos e os projetos de uma organização, permite perceber em que medida o desenvolvimento de um determinado projeto tem valor para o negócio e para a visão global da estratégia da empresa.

O desenvolvimento de um projeto compreende várias atividades que podem causar impacto na arquitetura de uma organização, assim como contribuir para a realização dos seus objetivos estratégicos. Arquitetura Empresarial (AE) oferece uma perspetiva holística das atividades atuais e futuras da organização e sobre as ações que devem ser tomadas para atingir os seus objetivos. ArchiMate é a linguagem que permite modelar a arquitetura de uma empresa, permitindo aos arquitetos empresariais descrever, analisar e visualizar as relações entre os domínios de negócio de uma forma não ambígua.

Para identificar o alinhamento entre os projetos e os objetivos estratégicos numa organização, propomos uma solução que compreende cinco passos, utilizando o ArchiMate como linguagem de modelação. A solução proposta tem como primeiros passos a identificação dos objetivos estratégicos e respetivas metas definidas, representado o valor de cada meta atingida para a organização, i.e. a importância da realização de um determinado objetivo estratégico para a organização. De seguida, são identificados os projetos da organização e o valor esperado de cada projeto para a organização. Finalmente, identificamos o alinhamento entre os projetos e os objetivos estratégicos da organização.

Durante a investigação, nomeadamente na implementação da solução, foi possível identificar os projetos em linha com os seus objetivos estratégicos da organização. A solução proposta foi demonstrada numa empresa pública. Em relação à avaliação, a tese foi avaliada através de um caso real, a fim de aplicar o método proposto na prática.

**Palavras-chave:** Alinhamento Organizacional, Objetivos Estratégicos, Projetos, Arquitetura Empresarial, ArchiMate.

# Abstract

When formulating an organization's strategy, researchers have emphasized the importance of organizational alignment, which is one of many organizational concerns. Making organization-wide strategic elements known, such as vision, mission and goals, more actionable to all employees, allows to relate the work done on a daily basis with the organization objectives.

For some organizations, having strategic objectives and metrics defined is sufficient for their strategy definition to be complete. However, without the necessary tools to properly implement that defined strategy and its adaptation to the business context, it becomes more difficult to survive the market competitiveness.

Organizational strategy and projects should be natural partners in any business. Projects are developed to create new products, implement requirements necessary to the business and even to respond to emergencies. After their implementation, projects' final results may or may not be in line with the defined strategic objectives. Finding the alignment between strategic objectives and projects within an organization, allows to realize to what extent the development of a certain project has value for the business and for the global vision of the company's strategy.

The implementation of projects causes changes that can impact an organization's architecture, as well as, contribute to the achievement of its objectives. Enterprise architecture (EA) offers a holistic perspective of the organization's current and future states. Moreover, EA provides a path between strategy and execution that can bring strategic and business concepts together by addressing stakeholder's concerns regarding all business' aspects and domains. ArchiMate is the standard language for the graphical modelling of EA. It enables enterprise architects to describe, analyze and visualize the relationships among business domains in an unambiguous way.

In order to identify the alignment between an organization's projects and strategic objectives, we propose a five steps solution using ArchiMate as the modelling language. The proposed solution comprises the following steps: identify an organization's strategic objectives and respective achieved targets (outcomes) and identify each outcome expected value to the organization, i.e. the importance and utility a specific achieved target has to the organization. Afterwards, identify an organization's projects and their expected value to the organization. Finally, identify the alignment between an organization's projects and its strategic objectives.

By following the proposed method, organizations will be able to identify which projects are in line with their strategic objectives and, ultimately, we expect to help organizations identify which projects can contribute to the achievement of their strategic objectives. The solution proposal was demonstrated in a government owned company. This master thesis was evaluated through a field study in order to apply the proposed method in practice.

**Keywords:** Organizational Alignment, Strategic Objectives, Projects, Enterprise Architecture, ArchiMate.

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# List of Acronyms

<b>Acronym</b>	<b>Term</b>
<b>EA</b>	Enterprise Architecture
<b>DS</b>	Design Science
<b>DSRM</b>	Design Science Research Methodology
<b>BSC</b>	Balanced Scorecard
<b>BMM</b>	Business Motivation Model
<b>KPI</b>	Key Performance Indicators
<b>PMO</b>	Project Management Office
<b>ROI</b>	Return on Investment
<b>NPV</b>	Net Present Value
<b>IRR</b>	Internal Rate of Return

# Glossary

Term	Definition	Source(s)
ArchiMate	An open and independent modelling language for enterprise architecture that is support by different tools vendors and consulting firms, providing instruments to enable enterprise architects to describe, analyze and visualize the relationships among business domains in an unambiguous way.	[4]
Architecture	The structure of components, their inter-relationships, and the principles and guidelines governing their design and evolution over time.	[26]
Design Science	Creates and evaluates IT artifacts intended to solve identified organizational problems.	[13] [14]
Design Science Research Methodology	A methodological guideline for effective DS research.	[13] [14]
Enterprise Architecture	Discipline or process area that aims to establish and maintain a common architecture consisting of business process, information, data, application and technology layers for effectively and efficiently realizing enterprise and IT strategies by creating key models and practices that describe the baseline and target architecture.	[26]
Methods	A set of steps used to perform a task – how to knowledge.	[27]
Project Management	The application of knowledge, skills, tools and techniques to project activities to meet the project requirements.	[8]
Stakeholder	An individual, team, or organization (or classes thereof) with interests in, or concerns relative to, the outcomes of the architecture. Different stakeholders with different roles will have different concerns.	[4] [26]
Strategic Management	The comprehensive collection of ongoing activities and processes that organizations use to systematically coordinate	[10]

	and align resources and actions with mission, vision and strategy throughout an organization.	
Strategic Objectives	Actions and activities an organization must do to implement its strategy and help achieve them. Something toward which work is to be directed, a strategic position to be attained, or a purpose to be achieved, a result to be obtained, a product to be produced or a service to be performed.	[8] [10]
Strategic Plan	A document used to communicate with the organization its goals, actions needed to achieve those goals and all of the other critical elements developed during the planning exercise.	[10]
View	The representation of a system from the perspective of a related set of concerns. An architecture view addresses one or more concerns held by a stakeholder of the system. It is designed to express the architecture of the system of interest in accordance with an architecture viewpoint.	[4] [9] [26]
Viewpoint	A specification of the conventions for constructing and using a view. It is a means to focus on particular aspects and layers of the architecture determined by the concerns of a stakeholder. A view is what you see; a viewpoint is where you are looking from – the vantage point or perspective that determines what you see.	[4] [9] [26]

# 1. Introduction

For many organizations having strategic objectives defined, means to have their business strategy completed [20]. However, the best-laid strategies can be useless without the proper implementation [12]. When formulating an organization's strategy, researchers have emphasized the importance of alignment. Organizational alignment requires a shared understanding of organizational goals and objectives.

Projects are expected to bring value, and different projects may have different impacts on the overall strategic objectives [19].

Organizations want to link projects to their business strategy, in order to get the best strategy implementation [21]. To ensure projects within organizations contribute to their strategic plan, organizations should start to integrate them in the strategic plan [20].

Each stakeholder requires specific information presented in an accessible way. There are several models addressing business strategy (Business Motivation Model, Balanced Scorecard, SWOT) but few of them define project as strategic initiatives and, even fewer, relate strategic objectives with projects [21]. The increasing complexity of issues involved, as well as, the growing diversity and heterogeneity of concerns and stakes of involved stakeholders, render pre-existing approaches less adequate.

Enterprise Architecture (EA) provides the insight needed to balance these requirements and facilitate the translation from corporate strategy to daily operations [21]. EA also provides a path between strategy and execution. It allows the organization to determine how certain strategic choices impact an organization's architecture, and also how projects help an organization achieve its strategic objectives.

In order to identify the alignment level between an organizations' projects and strategic objectives, we will use EA and ArchiMate. ArchiMate is the standard language for the graphical modelling of EA, enabling enterprise architects to describe, analyse and visualize the relationships among business domains in an unambiguous way [4].

The research methodology applied across this master thesis is the Design Science Research Methodology (DSRM) [13] [14], where a research proposal is developed to solve a problem. The goal of this methodology is to overcome research paradigms, such as descriptive and interpretative research, in which the outputs are most explanatory and, one could argue, are often not applicable to the solution of problems encountered in practice [13].

The DSRM process includes six steps, as represented in Figure 1: problem identification and motivation, definition of the objectives for a solution, design and development, demonstration, evaluation, and communication.

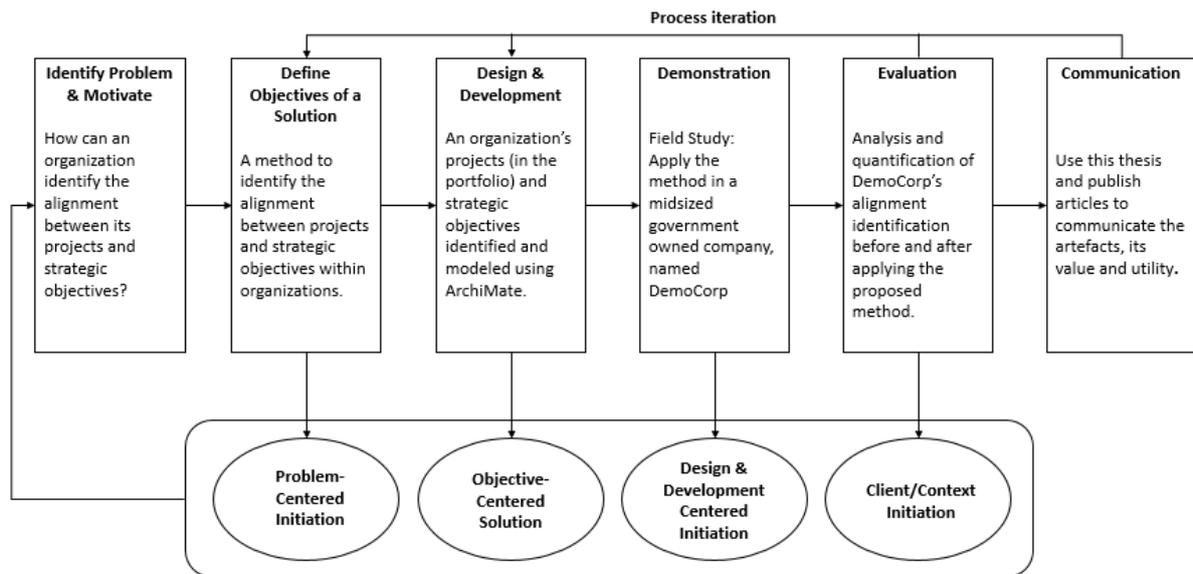


Figure 1 – The DSRM Process Model.

This methodology is expected to prove to be useful throughout this research, because it forces to do research in an iterative way, in order to obtain frequent and valuable feedback for the design process and its incremental improvement. With this methodology, we hope to achieve more valuable outcomes.

Each step of the DSRM process model corresponds to a section in this research work and to an essential part of its development. Section 2 (Research Problem) and Section 3 (Related Work) identify the problem and the motivation behind the research work. Section 4 (Proposal) details the objectives of the solution and the proposed solution. The solution is demonstrated in Section 5 (Demonstration) and evaluate in Section 6 (Evaluation). In Section 7 (Communication) and Section 8 (Conclusion) the research work is concluded with research communication, contributions, limitations and future work.

In Section 2, we formulate the research problem, where we address the issue of identifying the alignment between an organization's projects and its strategic objectives. The research problem was established after analysing the related work presented in the next Section.

Section 3 presents the related work that identifies and defines some key concepts considered relevant to the correct definition and implementation of the proposed method. We focus on two main concepts: Organizational Alignment and Enterprise Architecture. We address the first subject, in order to present important concepts from an organization's strategy layer to the operational layer (projects), as well as, the importance and distress of aligning this two layers. Regarding the second subject, we address Enterprise Architecture, in defining an enterprise's organizational structure, business processes, information systems, and infrastructure, as well as, introducing ArchiMate as an EA modeling language, used throughout this thesis, especially developing the proposed solution.

The proposed solution to identify the alignment between an organization's projects and strategic objectives is described in Section 4. It consists in a five step method, comprising the identification of an organization's strategic objectives, respective outcomes and projects, the representation of projects and

their expected value to the organization and, finally, the identification of the alignment between an organization's projects and its strategic objectives.

Section 5 describes the demonstration of the proposed solution in a midsized government owned company, named DemoCorp.

The evaluation and communication of this master thesis are addressed in Sections 6 and 7.

Finally, in Section 8 we synthesize the conclusions and future work to be developed, in order to address the problems addressed in this research.

## 2. Research Problem

This section describes the “Identify Problem & Motivate” step of the DSRM Process Model, where we will describe the research problem and justify the value of a solution. Moreover, we will specify the research problem that will be addressed in this dissertation work.

In [24], the Project Management Institute (PMI) ascertained that less than half of organizations report a high alignment of projects to organizational strategy and that a few of their projects are strategic initiatives – that is, projects designed to achieve formulated strategy. This research shows that organizations’ stated strategies can fail to shape what happens in practice.

For many organizations having strategic objectives defined, means to have their business strategy completed [20]. Strategic plans can fail due to poor communications, failure to manage changes, inability to predict environment reactions, among others. The best-laid strategies can be useless without the proper implementation [12].

Every project in an organization should contribute to its strategic plan, but how can we ensure this alignment? By integrating projects within the strategic plan, organizations are able to ensure that their strategies focus on “what we need to do to achieve these goals” and meet their needs and goals.

Organizations use strategy models, methods, frameworks as tools to formulate and analyze strategies, goals and objectives. However, the increasing complexity of issues involved, as well as, the growing diversity and heterogeneity of concerns and stakes of involved stakeholders, render those preexisting approaches less adequate.

Each stakeholder requires specific information presented in an accessible form. It is necessary but challenging to obtain an overview of all stakeholders’ concerns and needs and their impact on the organization. A good EA provides the insight needed to balance these requirements and facilitate the translation from corporate strategy to daily operations [21].

ArchiMate is the standard language for the graphical modelling of EA [4]. ArchiMate was developed as a cooperation project between several partners from business and academia to provide concepts and techniques to support enterprise architects in the visualization, communication and analysis of integrated architectures [21]. Many organizations recognize the value of these architectural models in understanding the dependencies between their people, processes, applications, data and hardware.

Therefore, the challenge to address is **how an organization can identify the alignment between its projects and strategic objectives**. In order to answer to this question, we need to consider the following ones:

- Can we model an organization’s strategic elements and projects using ArchiMate as modelling language?
- Is it possible to identify the value that a specific project has to the organization and model it using ArchiMate?

- Is it possible to identify the value that a specific achieved strategic objective's target has to the organization and model it using ArchiMate?
- Is it possible to identify and model a correlation between an organization's projects expected values and its strategic objectives using ArchiMate?

More precisely, we want to know which projects within an organization contribute to the achievement of its strategic objectives defined, i.e. if for every strategic objective, an organization can define programs and projects that, after their completion, will achieve those objectives. We will use ArchiMate as the modelling language, since we find it to be the language that best relates these strategic and business aspects of an enterprise.

Therefore, it is important that organizations identify the alignment between their projects and strategic objectives, in order to become more explicit, the degree to which their objectives can be achieved and the impact on their strategy. For that, ArchiMate modeling language provides support to the description, analysis and visualization of inter-related architectures within and across business domains to address stakeholders' needs and concerns.

# 3. Related Work

In the following sections, we will introduce concepts and relations considered relevant throughout this work.

## 3.1. Organizational Alignment

The importance of alignment is widely acknowledging in organizations. Literature defines alignment as a valuable and scarce resource that has significant consequences to organizational performance [29]. Moreover, Powell [28] connects organizational alignment to competitive advantage and Weiser [30] also describes organizational alignment as “heading in the same direction”.

The authors in [29] concluded that *organizational alignment can be used to improve internal processes and reduce inefficiencies, as well as, link the organization more closely to its external operating environment*. However, there is a considerable difficulty in arriving at a single definition of alignment, given all alignment types and perspectives. Business-IT alignment, strategic alignment, business-IS alignment are examples of alignment types described in the research literature. Despite some differences between them, they all address the need to make organization-wide strategic elements, such as vision, mission and goals, more actionable to all employees, relating the work employees do on a daily basis with the organization purpose [1]. These relations are represented in Figure 2.

Porter [16] defined the concept of strategy as *the creation of a unique and valuable position, involving a different set of activities*. By introducing the notion of different or unique activities, Porter offers a bridge into the world of project management [15]. Establishing a strategy, defining goals and objectives, narrows the focus on what the organization wants to accomplish. Knowing an organization’s architecture, relating its projects and programs with its strategy can help an organization to determine how to accomplish established objectives.



Figure 2 – Relating strategic concepts with projects in the context of an enterprise [17].

The development of a project can be held as a strategy to achieve an objective. The implementation of initiatives and projects cause changes that can impact an organization's architecture, as well as, contribute to the achievement of its objectives [21].

Understanding how these elements relate with each other and with other elements within the organization is challenging. Organizations use models, frameworks and methods, to define, understand and relate all elements within an organization and find which dependencies exist among them.

In this master thesis, we provide a method for organizations to identify the alignment between their projects and strategic objectives. In order to better understand and relate those concepts, we will address strategy models familiar to organizations, as well as, link strategy to enterprise architecture.

### 3.1.1. Strategy Models

Strategy is a combination of all decisions and actions a company undertakes to provide its clients more value than its competitors in a sustained way [32]. Creating an organization's strategy involves the definition of, essentially, the following concepts [15] [17] [32]:

- **Mission:** Describes what the organization is, what it stands for and its purpose. It explains why the organization exists and where it intends to go;
- **Vision:** Describes its desired future state, providing long-term direction to the organization;
- **Goal:** Goals are what an organization wants to achieve. They tend to be longer term and defined qualitatively rather than quantitatively.
- **Objective:** measurable steps to achieve a strategy and should be in line with the mission outlined. It is a step along the way towards a Goal and provide the basis for measuring whether progress is being made.

Strategy models relate all these concepts and provide strategic management a way to coordinate and align resources and actions with an organization's mission, vision and overall strategy [10]. Among all strategic models familiar to organizations, we focus on the Business Motivation Model (BMM) [35] and Balanced Scorecard (BSC) [7]. We address these two models in this thesis, since we will use their elements and relations to help design our proposed solution.

#### ***Business Motivation Model (BMM)***

The Business Motivation Model (BMM) [35], developed by the Business Rules Group (BRG), provides a scheme or a structure for developing, communicating, and managing business plans in an organized manner.

The BMM identifies and defines the elements of business plans, indicating how all these factors and elements inter-relate. The main elements, represented in Figure 3 below, are categorized as the End and Means concepts.

An End is something the business seeks to accomplish, but it does not include any indicator of how it will be achieved. Vision, goal and objective are considered End concepts.

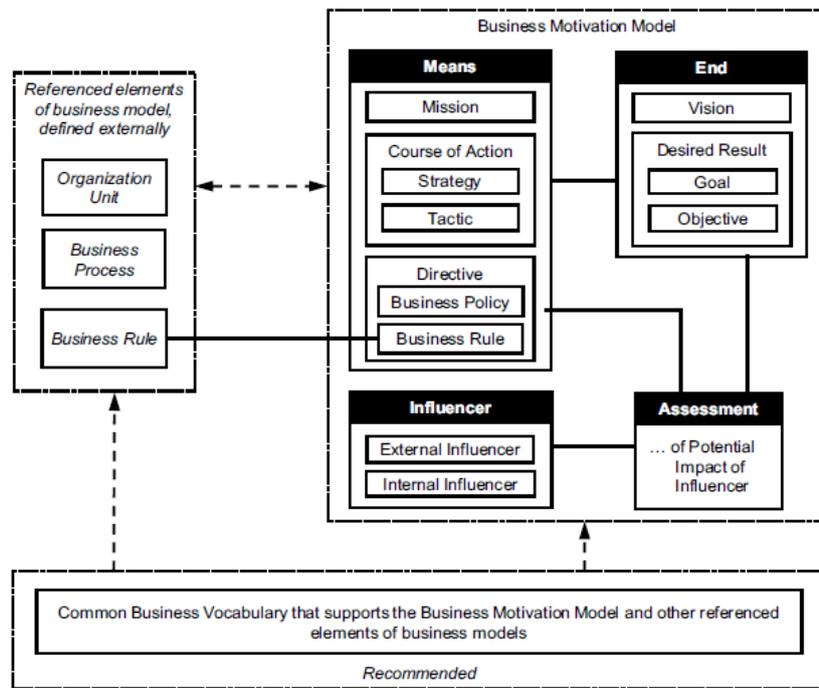


Figure 3 – BMM overview [35].

The Means are what an enterprise has decided to do, in order to become what it wants to be, it indicates the ongoing operational activity of the enterprise. Means are organized into Mission, Courses of Action and Directives. Directives are categorized as Business Rules and Business Policies. In the context of this thesis, we focus on Business Rules.

The BMM adopted the concept of Business Rule from the OMG specification for “Semantics of Business Vocabulary and Business Rules” (SBVR) [36]. The SBVR is a vocabulary consisting of interrelated sub-vocabularies. It permits to capture the semantics of sentences commonly used to express business rules, and represent it as terms and facts.

A Business Rule is a rule under business jurisdiction that always introduces an obligation or necessity [36].

Some Business Rules can be automated in software, becoming an important part of the organization’s daily activities. They define and constrain parts of the organization to assert structure and guide behaviour.

In this dissertation, we will define two business rules, based on the SBVR, in order to establish a business vocabulary that supports the definition of certain elements within organizations. Organizations manage complexity and ambiguity better when using business rules to guide behaviour.

## Balanced Scorecard (BSC)

The Balanced Scorecard (BSC) is a successful strategic management method, originated by Drs. Robert Kaplan and David Norton, as a performance measurement framework that included financial measures and operational measures on customer satisfaction, internal processes and the organization's innovation and improvement activities.

Although it's worldwide dissemination, BSC demonstrated some inadequacy in certain circumstances, namely, in dynamic environments. Therefore, the BSC has evolved from its early use to become a strategic planning and management framework [10] that highlights the importance to align an organization's strategic planning and management components with projects, allowing organizations to clarify their vision and strategy and translate them into action.

Figure 4 represents an overview of the internal and customer perspectives from the strategic planning and management framework. This framework provides a top-down approach by defining an organization strategic elements and connecting it to its projects.



Figure 4 – BSC Internal and Customer perspectives overview [10].

The figure shows four elements: Objectives, measures, targets and initiatives. Strategic objectives are used to decompose strategy into actionable components that can be monitored using Performance Measures. These measures are often referred as key performance indicators (KPI) and are quantifiable, allowing the organization to track results against objectives' targets [10].

Finally, associated to each strategic objective are strategic initiatives, defined as actions that translate strategy into a set of high-priority projects that contribute to the achievement of the organization's objectives [10].

Projects may be designed and implemented to meet strategic objectives [15]. By relating an organization's strategic objectives with projects, it becomes clearer the extent to which the planned strategy is realized and also whether the implementation of projects has indeed value for the business.

In this Section, we established the importance of organizational alignment and the strategic elements involved in the strategy definition process. Setting a strategy, defining objectives, setting targets and measure them will be to no avail, unless actions are put in place to evoke change. Therefore, defining quantifiable measures for strategic objectives is needed, but defining how to achieve them is key [10]. Projects are a means for achieving organizational objectives [8].

### 3.1.2. Strategic Initiatives

In the previous sub-section, we explored the relation between an organization's strategic objectives and strategic initiatives defined as projects and programs within the organization. In this section, we aim to explore in what way those projects and programs can be associated to strategic objectives.

Organizations can have projects, programs and portfolio, defined as [8] [15]:

- **Portfolio:** Collection of projects or programs that are grouped to facilitate effective management and meet strategic business objectives. The projects or programs in the portfolio may not necessarily be interdependent or directly related;
- **Program:** Group of related projects managed in a coordinated way to obtain benefits and control not available from managing them individually;
- **Project:** A temporary endeavour undertaken to create a unique product, service, or result.

The Project Management Office (PMO) is an organizational unit assigned various responsibilities related to the centralized and coordinated management of those projects under its domain. Its responsibilities can range from providing project management support functions to the direct management of a project [8].

The PMO can also be responsible for looking at each project's expected, measurable value and align them with one or more of the company's strategic goals [22].

Every project's expected, measurable value can be in line with one or more of the company's strategic goals [22]. The definition of value will certainly differ in accordance with the organization's focus, strategies and types of projects.

Project management, by definition, is the application of knowledge, skills, tools and techniques to project activities to meet project requirements. Managing a project typically includes balancing the competing project constraints including the scope, quality, value, schedule, budget, resources and risk [8].

The value criteria identify what is important to the organization's customers and what financial benefits does a project bring to the organization.

All projects have a financial aspect to them, and companies often use their quantifiable value to help them decide if a project is worth the investment. However, it is not always the highest-scoring projects that make it [34].

According to Levine [34], even though the financial value is the primary factor for project prioritization, further aspects should be considered, such as the alignment with the organization strategy and tactical plans. Associating the value of a project with the organization's business objectives may also help decide if a project is worth the investment or not.

## 3.2. Enterprise Architecture

The implementation of initiatives and projects cause changes that can impact an organization's architecture, as well as, contribute to the achievement of its objectives. A well-defined architecture is an important asset in positioning new developments within the context of the existing process, IT systems, and other assets of an organization, as well as, helping in identifying necessary changes [21].

An architecture at the level of an entire organization is called enterprise architecture (EA). EA, by definition, is a coherent whole of principles, methods, and models that are used in the design and realization of an enterprise's organizational structure, business processes, information systems, and infrastructure [9].

A good architectural practice helps a company innovate and change by providing both stability and flexibility. The insight provided by an enterprise architecture is needed in determining the needs and priorities for change from a business perspective, and in assessing how the company may benefit from technological innovations [21].

The role of the architect is to address stakeholders' concerns by identifying and refining motivation and strategy, developing and creating views of the architecture [7]. Moreover, EA provides a path between strategy and execution that can bring strategic and business concepts together by addressing stakeholder's concerns regarding all business' aspects and domains.

ArchiMate [3] [4] is a modeling language from The Open Group that provides a uniform and graphical representation of EA. In this thesis, we will only focus on elements from ArchiMate's core layers, Motivation and Implementation & Migration extensions described in the following sub-section.

### ArchiMate

ArchiMate [3] [4] is an open and independent EA modelling language from The Open Group. It enables enterprise architects to describe, analyze and visualize the relationships among business domains [4].

Different stakeholder groups may require different notations in order to understand an architecture model or view. Therefore, the ArchiMate language differs from others, which have only one standardized notation [4]. ArchiMate also provides viewpoints that are a means to focus on particular aspects of the architecture, allowing the representation of the proposed solution in a coherent and detailed way.

Further, it provides a graphical language of EA over time (not static) [4]. ArchiMate offers support for modeling four (related) aspects of an enterprise, the **Enterprise itself**, with core elements from the three layers, such as processes, roles and behavior, the **Strategy of the Enterprise**, with strategy elements, the **Change of the Enterprise** is modeled with Implementation & Migration elements such as Work Package, Plateau and Deliverable, and finally, the **Intentions of an Enterprise** architecture, the "why", with Motivation elements such as drivers, goals, requirements and principles [25]. The meta-models regarding the core and non-core elements and their relations are represented in Appendix B and C.

To model the Enterprise Itself, we use core elements that are distinguished between three layers [3] [4]:

- **Business Layer:** used to model the business architecture, describing the structure and interaction between the business strategy, organization, functions, business processes and information needs.
- **Application Layer:** used to model the information systems architecture of the enterprise, describing the structure and interaction of the applications.
- **Technology Layer:** used to model the technology architecture of the enterprise, describing the structure and interaction of the platform services, logical and physical technology components.

Each of these layers contains structural, behavioral and informational aspects and also defines relations between and within layers. In this master thesis, we will consider the ArchiMate 3.0 Specification layers, extensions and aspects represented in Figure 5. Besides representing ArchiMate layers, in Figure 5 is also represented the fundamental separation into active structure (who acts), behaviour (what act) and passive structure (upon what) [25].

Within context of this work, we will focus on elements from the core layers (Business, Application and Technology) and from the Motivation and Implementation & Migration extensions. It will allow us to better represent and relate motivational concepts, regarding an organization's intentions towards their customers, to improve its business or optimize its structure and processes, with elements used to define and represent the change that developing projects may bring to the organization.

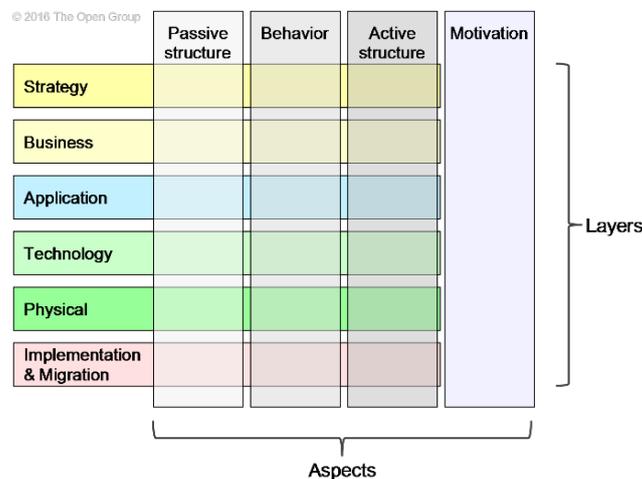


Figure 5 – ArchiMate Framework [25].

We will use some elements from the following viewpoints to represent the proposed solution steps. The **Motivation Viewpoint** (Figure 6) allows the enterprise architect to model the organization's motivational aspects, relating stakeholders, their primary goals, the principles applied, and the main requirements on services, processes, applications and objects [4].

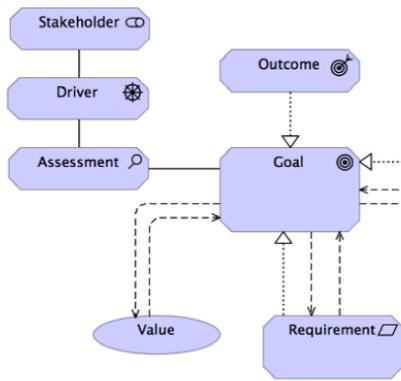


Figure 6 – Motivation Viewpoint.

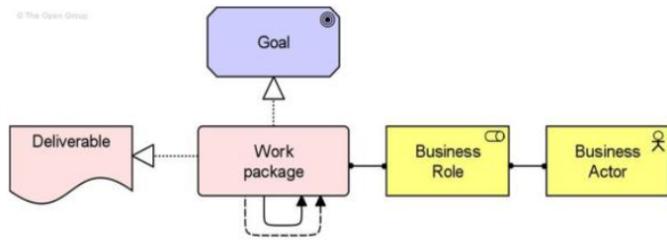


Figure 7 – Project Viewpoint.

The **Project Viewpoint** (Figure 7) is used to model the management of architecture change. The architecture of the migration process from an old situation (current state enterprise architecture) to a new desired situation (target state enterprise architecture) has significant consequences on the medium and long-term growth strategy. With this viewpoint, we are able to relate business goals to programs and projects, making it possible to analyze, at a higher level, whether all business goals are covered sufficiently by the current portfolio(s) [4].

### Value

In [18] the authors argue that value should not only be considered in relation to an organization's environment but also internally. Any architectural element (or project) has value for its users, therefore, the authors propose to broaden the definition of value. In [2] the authors also propose an extension of the value definition.

The new ArchiMate Specification was created in order to better address the relation between EA and business strategy, by adding concepts for modelling strategy, increasing the usage of EA in supporting strategy execution.

In ArchiMate's Specification 3.0, the Value element (Figure 8) is defined as the *relative worth, utility, or importance of a core element or an outcome*.

Value may apply to what a party gets by selling or making available some product or service, or it may apply to what a party gets by buying or obtaining access to it [4].

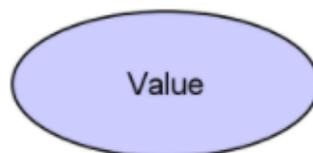


Figure 8 – Value Notation

In this master thesis, we use the Value element in order to represent the project value to the organization. The value of a project is often identified with financial measures, to decide if it is worth the investment or not.

Return on Investment (ROI), Net Present Value (NPV) and Internal Rate of Return (IRR) are three financial measures often used by organizations to select and prioritize projects. They measure the financial gain/loss of a project in relation to its cost and, indicate if the projected earnings generated exceed the anticipated costs, generating profit [33] [34].

Value is often expressed in terms of money, but it has long since been recognized that non-monetary value is also essential to business [4].

Although, a project financial value has importance, we focus only on the non-monetary value of a project to the organization, considering it to be the element that allows the connection between projects and strategic objectives.

### **3.3. Research Conclusions**

The literature research presented in this Section 3, allowed to understand the importance of organizational alignment, but also the difficulty in defining it and, consequently, implementing it.

This inability to execute can be related to the lack of communication between executives who define the organization strategy, and the employees who implement and manage projects, causing changes in the organization. This lack of understanding between both parts leads to strategic objectives not achieved and strategies abandoned.

We also concluded that the BSC evolved in order to introduce the alignment concept within organizations, connecting strategic objectives with projects being developed in the organization. However, using this framework to align projects with strategic objectives in organizations that already have their strategy defined and ongoing projects, requires a considerable understanding and possible redefinition of strategic elements and projects scope.

Projects and organizational strategy should be natural partners in any business.

Organizations can easily identify a project's financial value using financial methods but, its strategic contribution to the achievement of the organization's objectives, as the qualitative value, is far more difficult. Both values are equally important, but in the context of this thesis, we will further address the influence that a project value has in an organization strategy.

Moreover, the quantifiable value delivered by a project can only be truly measured after the project is over, and the qualitative value of a project can be identified in the early stages of the project's scope and objectives definition.

Strategic objectives are continuous improvement activities to implement an organization strategy, and break down the more abstract concepts like mission and vision into actionable steps.

Establishing a strategy, defining goals and objectives narrows the organization's focus on what the organization wants to accomplish. Knowing an organization's architecture, relating its projects and programs with its strategy can help an organization determine how to accomplish established objectives.

# 4. Proposal

In Section 3, we analyzed related work in order to identify and define some key concepts considered relevant to the correct definition and implementation of the proposed method.

This Section describes the second and third steps of the DSRM process, “Define objectives of a solution” and “Design & Development”, as we present this thesis objectives and the proposed solution to the research problem addressed in Section 2.

## 4.1. Thesis Objectives

We aim to propose a solution, using ArchiMate as the modelling language, to identify the alignment between an organization’s projects and its strategic objectives. ArchiMate provides viewpoints that allow us to represent concepts and relations essential to create a solution that will help organizations identify their current alignment in order to improve it. This dissertation has the following objectives:

1. Identify and model an organization’s projects and strategic objectives using ArchiMate as the modelling language;
2. Identify for every project, its expected value for the organization, i.e. the importance and utility that a certain project has, that justifies its development in the organization, and represent it using ArchiMate;
3. Identify for every strategic objective’s achieved target, its expected value for the organization, i.e. the importance and utility that a certain achieved target has to the organization, besides realizing strategic objectives.
4. Through both expected values, establish a relation between each project within the organization and their strategic objectives;
5. Identify which organization’s projects are in line with its strategic objectives using ArchiMate;
6. Hopefully, help organizations identify which projects can contribute to achieve their strategic objectives.

We also propose to demonstrate the proposed solution by applying it to one government owned company (field study), named DemoCorp. This work will be evaluated by the field study demonstration.

## 4.2. Identify the alignment with ArchiMate

EA, by supporting a holistic organization view, helps in designing all business domains in order to meet vision, mission, and business goals and to ultimately deliver enterprise strategy.

ArchiMate offers a cohesive link among the three layers (business, application, and technology) and among each layer and extensions (Strategy, Motivation and Implementation & Migration). It includes concepts for specifying inter-related architectures and specific viewpoints for selected stakeholders.

Establishing and maintaining a coherent EA is a complex task involving different people with distinct backgrounds. ArchiMate advocates an approach in which architects and other stakeholders can define their own views on EA [3].

Modeling strategy with ArchiMate provides new possibilities for linking strategy to portfolio management and the architecture of an organization. In [11] the authors considered that by having a relation between projects and the strategy they implement, a more advanced analyses can be performed to determine how much each project contributes to a strategy and to the overall direction than an organization wishes to pursue. Relating business strategy, enterprise architecture and projects provides a way to align an organization's strategy with its tactics and operations.

We will use concepts from ArchiMate's Project and Motivation viewpoints to represent the proposed method. Motivational concepts allow a complete or partial overview of an organization's motivation aspects. Project viewpoint elements allows the representation of projects and programs within an organization. The concepts used in these viewpoints allow us to analyze at a high level whether all business goals are covered sufficiently by all projects identified.

Note that, in this research, we aim to propose a solution to identify the alignment between an organization's projects and its strategic objectives using ArchiMate. We do not intend to align it nor measure it, rather identify the current state of the alignment.

In Figure 9 below, we represent the proposed method's steps for identifying the alignment between an organization's projects and its strategic objectives. The solution proposal has five steps described in more detail in this Section.

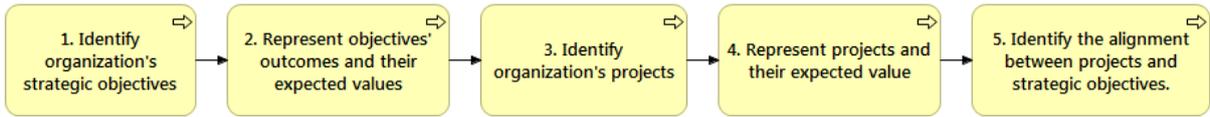


Figure 9 – Solution proposal.

Firstly, we identify the organization's strategic objectives and respective outcomes (achieved targets), representing their expected value to the organization. Afterwards, we identify the organization's projects and represent their expected value to the organization. Finally, identify the alignment between an organization's projects and strategic objectives.

In Section 2, we formulated the research problem that restricts the spectrum of the architecture views of our system of interest. Table 1 represents the architecture viewpoints used in each step of the proposed solution.

Solution's steps	ArchiMate Architecture Viewpoint		
	Organization viewpoint	Motivation viewpoint	Project viewpoint
1. Identify organization's strategic objectives.		X	
2. Represent objectives' outcomes and their expected values.		X	
3. Identify organization's projects.	X		X
4. Represent projects and their expected values.			X
5. Identify the alignment between projects and strategic objectives.			X

Table 1 – Solution's steps – Architecture viewpoints.

Figure 10 relates all viewpoints used in the proposed solution and represents all elements and relations between them. We propose a solution using only elements that will help us identify the alignment between an organization's projects and strategic objectives.

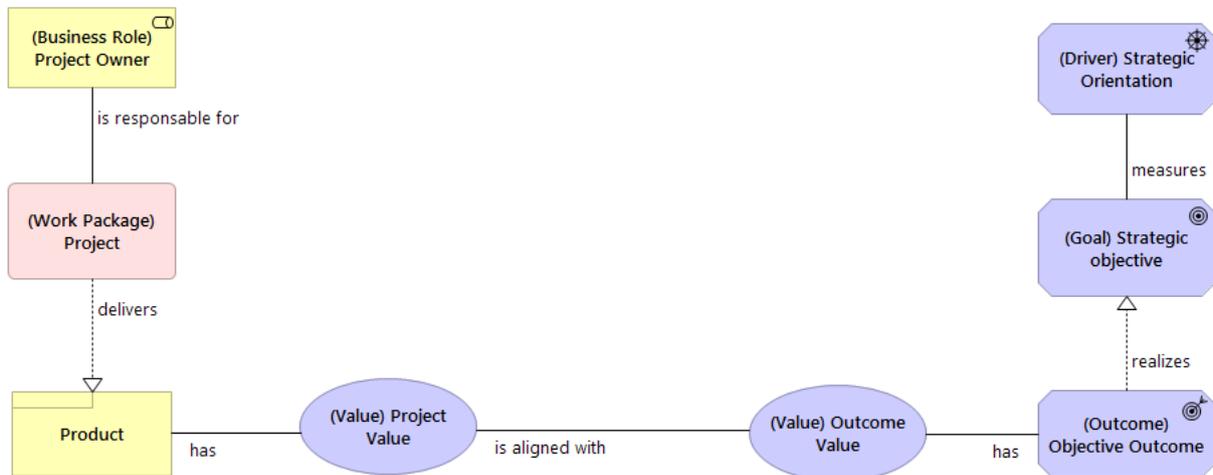


Figure 10 – Generic viewpoint to identify the alignment between projects and strategic objectives.

We represent a specific project through the Work Package element. A project has a project owner, responsible for it. If the organization has a portfolio (a collection of projects and programs), we can also represent the program associated with the project. A Program is also represented through the Work Package element.

Every project delivers an end result, either tangible or intangible, and we represent them using the Product element. A Product may be offered both internally to the organisation and externally to customers and has a certain value to the organization associated with it. The Value element, defined as the project's expected value to the organization, represents the importance and utility of a project to the organization and it is the element that will allow us to associate a specific project to the organization's strategic objectives.

In order to understand that connection it is also important to know how strategic objectives are defined within an organization, therefore, we identify the organization's strategic orientations, represented with the Driver element, measured by strategic objectives represented through the Goal element. Every strategic objective has a defined target that, when achieved, the strategic objective is achieved. The Outcome element represents a target to be met by the organization in order to achieve the objective. The outcome (target achieved) brings value to the organization, besides measuring the strategic objectives achievement. If a project value is similar to the outcome value, then we can conclude that project is in line with the strategic objective.

In the next subsections, we will describe the five steps proposed in Figure 9 to identify the alignment between an organization's projects and strategic objectives.

#### **4.2.1. Step 1 – Identify organization's strategic objectives.**

**Input:** Documentation regarding the organization's strategy.

**Output:** Identification of organization's strategic orientations (drivers), strategic objectives and respective outcomes.

Firstly, we aim to identify and model the organization's strategic objectives, using ArchiMate as the modelling language. To identify them, we will analyse documentation regarding the organization's strategy, where the organization's goals and objectives, its mission, vision and values, as well as, a strategic analysis of their products, clients and overall business are defined. This information is often presented as the organization's strategic plan. The strategic plan also describes the organization's strategy development approach, i.e., the organization's method to define its drivers (mission and vision), strategic objectives and other motivational elements essential to strategy definition.

Quite often, an organization's strategy definition approach starts with the definition of the organization's mission, vision and core values. These concepts are defined by organizations to communicate, at a high level, to their environment and stakeholders what their activities are and what they intend to achieve in the future. Once these elements have been established, an organization is able to define its strategic orientations and objectives.

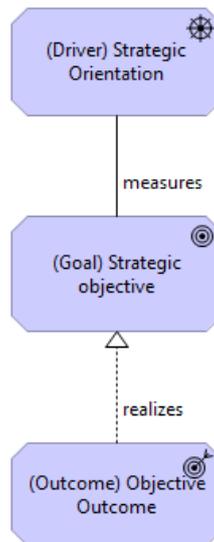


Figure 11 – Generic viewpoint template to represent an organization motivational elements.

Using the viewpoint represented in Figure 11 and analysing documentation regarding an organization’s strategy, we are able to identify and model its strategic orientations (drivers), represented with the driver element that, by definition, is an external and internal condition that motivates the organization to define goals. When all strategic orientations are represented, we are able to identify the strategic objectives defined to measure them. For every strategic objective, is defined a target that, when achieved, becomes an Objective Outcome that realizes the associated strategic objective.

#### 4.2.2. Step 2 – Represent objectives’ outcomes and their expected values.

**Input:** Documentation regarding the organization’s strategy.

**Output:** Definition of objectives’ outcomes expected values.

A strategic objective is achieved only when its defined target is met. An objective outcome represents an end result that has been achieved, i.e. the objective’s target that has been met and, therefore, realizes the associated strategic objective.

Achieving the objective outcome brings value to the organization. The Value element and its definition have changed in the more recent ArchiMate Specification. As referred previously, Value is now a motivational element that represents the relative worth, utility, or importance of a core element or an outcome [4].

The Outcome Value represents the importance of the outcome and respective strategic objective to the organization, i.e. what the organization gains with the strategic objective achievement. This value can be identified from the analysis of documentation regarding the organization’s strategy, namely, regarding the definition of strategic objectives and strategic orientations.

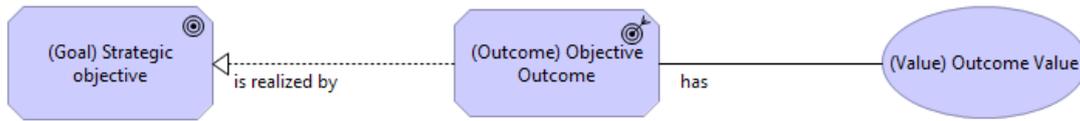


Figure 12 – Generic motivation viewpoint template to represent outcome values.

Using the viewpoint represented in Figure 12, we are able to model an organization’s objectives outcomes and their expected value.

To represent the **Outcome Value**, we establish the following Business Rule:

- *It is obligatory that each outcome value is defined by exactly one transitive verb followed by the direct object that complements the verb.*

A transitive verb has, essentially two characteristics. First, it is an action verb expressing a doable activity and second, it must have a direct object, something or someone who receives the action of the verb. Examples of transitive verbs: Promote, develop, increase, optimize, reduce, and comply, among others.

In [4], it is recommended to try and express the name of a Value as an action or state that can be performed or reached. We established this business rule to simplify its definition and follow that recommendation. With the transitive verb, we ensure the outcome value as an action and, with the direct object, its conclusion.

### 4.2.3. Step 3 – Identify organization’s projects.

**Input:** Documentation regarding the organization’s projects.

**Output:** Identification of the organization’s projects and project owners.

Secondly, we aim to identify and model the organization’s projects, using ArchiMate as the modelling language. Organizations have projects, however, in some cases, they can also have a portfolio that, by definition, is a collection of projects and programs not necessarily interdependent or directly related.

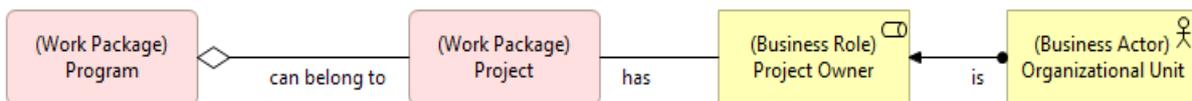


Figure 13 – Generic project viewpoint template to represent organization’s projects.

Using the viewpoint represented in Figure 13, we are able to model an organization’s projects, project owners and, if an organization has a portfolio, the respective program where the project is integrated.

#### 4.2.4. Step 4 - Represent projects and their expected values.

**Input:** Documentation regarding the scope and purpose of projects identified in Step 3.

**Output:** Identification of projects expected value to the organization.

In this step, we analyze projects' documentation and represent, for every project identified in Step 3, what are their final product, represented by the Product element, and their expected value to the organization, represented by the Value element.

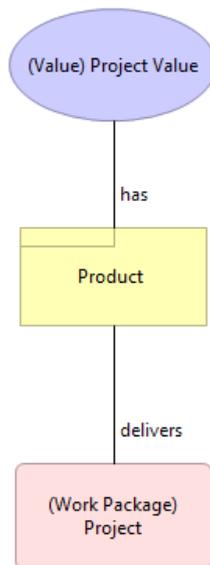


Figure 14 – Generic template to model the organization's projects and their expected value viewpoints.

Figure 14 represents the generic viewpoint used as template for all viewpoints modeled in this step. This viewpoint is used to identify the final product that a project delivers and its expected value to the organization.

The project expected value represents the project's utility and importance to the organization, i.e. what the project provides, ultimately, to the organization that justifies the need to implement it. Our solution requires the clear identification and validation of the project value by the organization. Through this element, we will be able to identify the alignment between an organization's project and its strategic objectives.

To represent the **Project Value**, we establish the following Business Rule:

- *It is obligatory that each project value is defined by exactly one transitive verb followed by the direct object that complements the verb.*

In [4], it is recommended to try and express the name of a Value as an action or state that can be performed or reached. We established this business rule to simplify its definition and follow that recommendation. With the transitive verb, we ensure the project value as an action and, with the direct object, its conclusion.

Note that, to complete this step, it must be applied to all projects identified in Step 3.

### 4.2.5. Step 5 – Identify the alignment between projects and strategic objectives.

**Input:** Organization’s projects and their expected value (output Step 4) and the organization’s objectives and expected values (output Step 2).

**Output:** Solution – Identification of projects in line with DemoCorp’s strategic objectives.

In this step, we will analyze organization’s projects and their expected value viewpoints from Step 4, as well as, the organization’s strategic objectives and their expected value identified in Step 2. Each project is represented with a specific viewpoint, so the input of this step will be as much viewpoints as the number of projects represented in the previous step. Figure 15 represents the generic template used to model all viewpoints in this step.

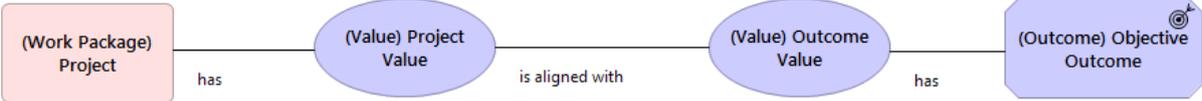


Figure 15 – Generic template to model the alignment between an organization’s projects and strategic objectives viewpoints.

Every project has an expected value for the organization (output of Step 4), defined according with the business rule. Every strategic objective has an outcome, which value is also defined accordingly with the business rule. If the value that a project has 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 an outcome value, then we will only represent the project and its expected value, without the associative relation.

Note that, to complete this step, it must be applied to all projects defined in Step 3 and represented in Step 4, in order to identify the alignment between an organization’s projects and its strategic objectives.

# 5. Demonstration

This section corresponds to the demonstration activity of DSRM process model [13]. The demonstration activity aims to demonstrate the use of artifacts to solve the one or more instances of the research problem.

We used a midsized government owned company for the demonstration, named DemoCorp (see Appendix A). DemoCorp has a portfolio with more than seventy projects and eight thematic programs. The portfolio is managed by the Project Management Office (PMO), a governance mechanism that monitors DemoCorp's projects in the portfolio, promoting organizational alignment and increasing efficiency and effectiveness levels in projects development. DemoCorp has also a strategic plan defined for a period of three years.

In order to better address the identified problem and demonstrate the proposed solution we selected ten projects in the portfolio. Since DemoCorp has every project in the portfolio associated with a thematic program, and in order to facilitate that selection, we chose projects from two different programs: **Innovation, Research & Development** and **DemoCorp Certification and Security**. The first program has eight projects and the second program has two projects.

## 5.1. Step 1 – Identify organization's strategic objectives.

To identify DemoCorp's strategic objectives, it was imperative to understand how DemoCorp's strategy was defined. The process of defining DemoCorp's strategy started with the redefinition of its mission, vision and core values. These concepts are essential to the elaboration of DemoCorp's strategic plan, where it is also defined its strategic orientations and strategic objectives. The first ensures the sustainability of a company's activity and the creation of long-term value, and the second, aims to potentiate and also measure the realization of strategic orientations and are the basis for the operational objectives definition.

When analyzing DemoCorp's strategic plan, we were able to identify its mission, vision and core values. These elements help stakeholders define the organization's strategic orientations (drivers for the organization), strategic objectives and respective outcomes.

We identified DemoCorp seven drivers described as strategic orientations, DemoCorp's twenty-one strategic objectives and respective outcomes. Each strategic orientation is numbered (from 1 to 7) and has, respectively, three strategic objectives associated (also numbered from 1.1 to 7.3 according with the strategic orientation).

In Figures 16 and 17, we represent the association between DemoCorp's strategic orientations, its strategic objectives and outcomes.

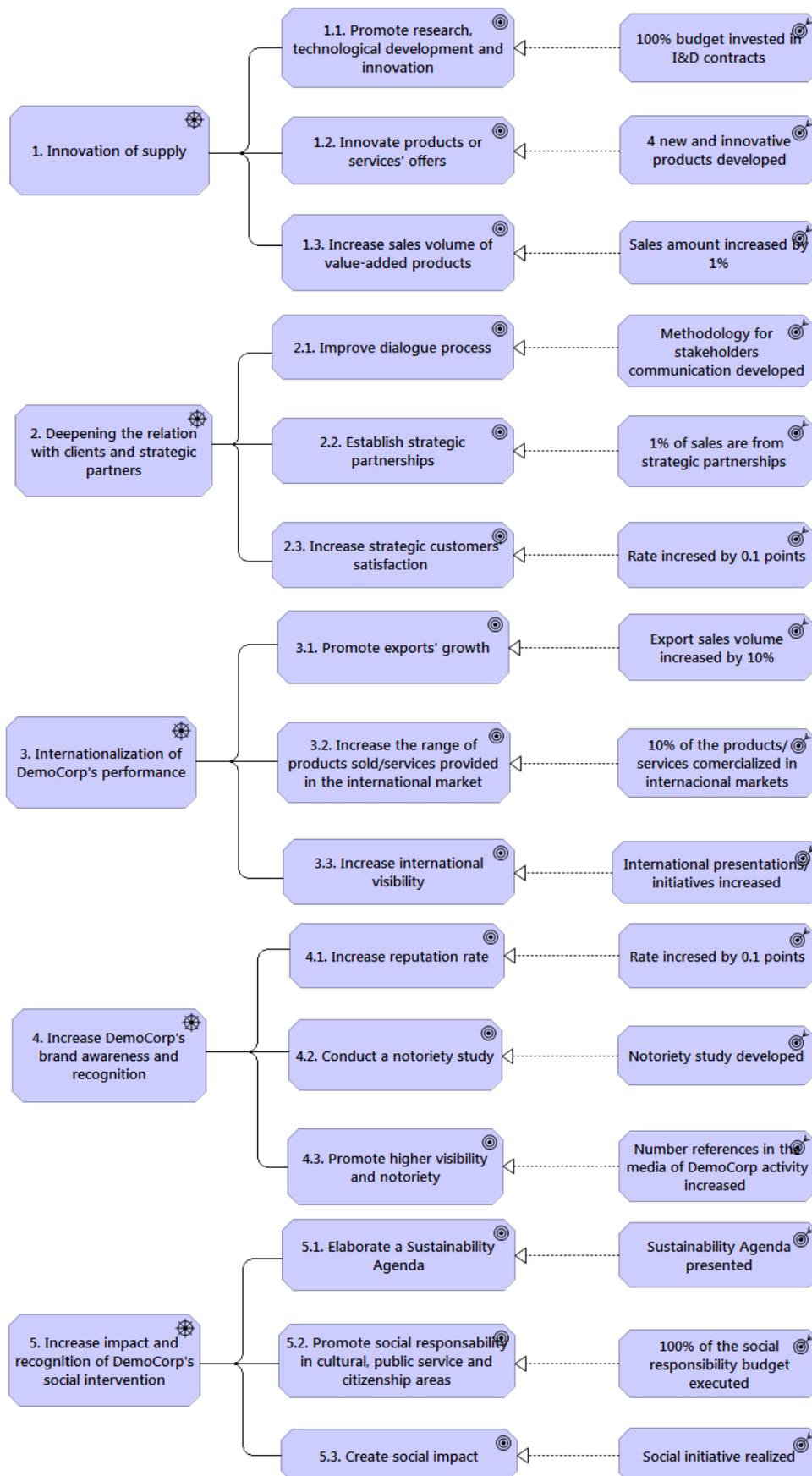


Figure 16 – Association between DemoCorp's strategic orientations (drivers) and strategic objectives.

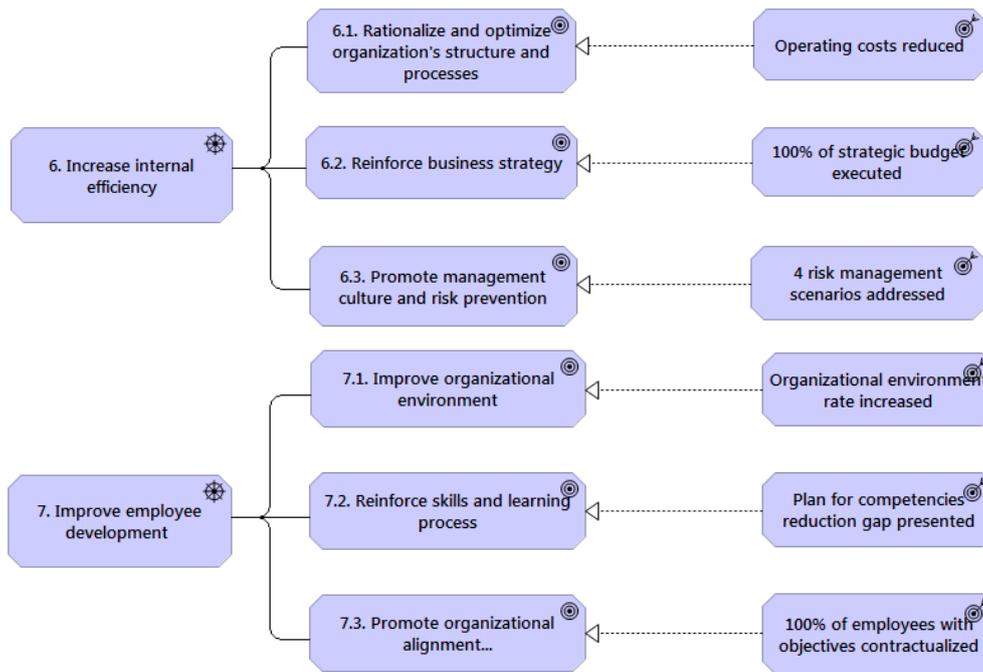


Figure 17 – Association between DemoCorp’s strategic orientations (drivers) and strategic objectives (continuation).

There are strategic objectives that are not designed to be achieved by a project in any way, therefore, each organization has to determine and decide if is necessary to exclude any strategic objective from this analysis. DemoCorp decided to not exclude strategic objectives.

The strategic objectives and outcomes identified in the figures above will be the input for the next step of the proposed solution.

## 5.2. Step 2 – Represent objectives’ outcomes and their expected values.

In this step, we analyze documentation regarding organization’s strategy, as well as, the strategic objectives and outcomes identified in the previous step, in order to identify each outcome expected value to DemoCorp. As mentioned before, the Outcome Value represents the importance of the outcome and respective strategic objective to the organization, i.e. what the organization gains with that outcome.

In order to represent every outcome value, we used the business rule defined in Section 4, using a transitive verb and a direct object that complements it.

Using the viewpoint represented in Figure 12, we are able to model DemoCorp’s objectives outcomes and their expected value.

Figure 18 represents the strategic objectives, outcomes and their expected values to DemoCorp. These strategic objectives measure the first strategic orientation, Supply Innovation, driving DemoCorp to promote investigation and technological development, to create new and innovative products and services, and to increase its sales volume.

To promote research and technological development, DemoCorp has to fully invest in Innovation & Development contracts. By doing so, DemoCorp will diversify its product portfolio. To innovate products or services, DemoCorp has to develop four new and innovative products. By doing so, DemoCorp will increase its products and services portfolio. To increase sales volume, the sales amount must increase by 1%. By doing so, DemoCorp will increase its product sales.

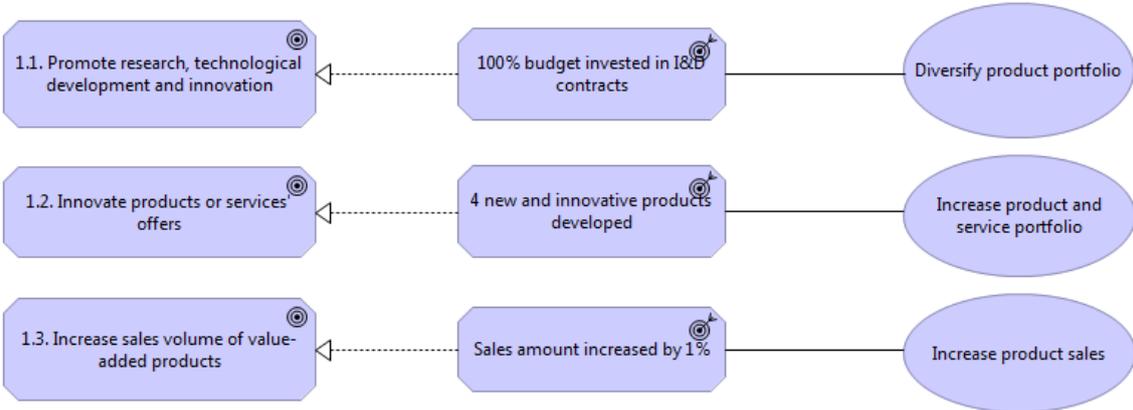


Figure 18 – Strategic objectives outcomes and their expected values.

Figure 19 represents the strategic objectives, outcomes and their expected values to DemoCorp. These strategic objectives measure the second strategic orientation, deepening the relation with clients and strategic partners, driving DemoCorp to improve dialogue process with strategic partners and customers, increasing their satisfaction.

To improve the dialogue process, DemoCorp has to develop a methodology for stakeholder communication. By doing so, DemoCorp will improve its relation with stakeholders. To establish strategic partnerships, 1% of DemoCorp's sales must be from strategic partnerships. By doing so, DemoCorp will increase strategic partnerships. To increase strategic customers' satisfaction, DemoCorp's rate must increase by 0.1 points. By doing so, DemoCorp will increase its customers' satisfaction.

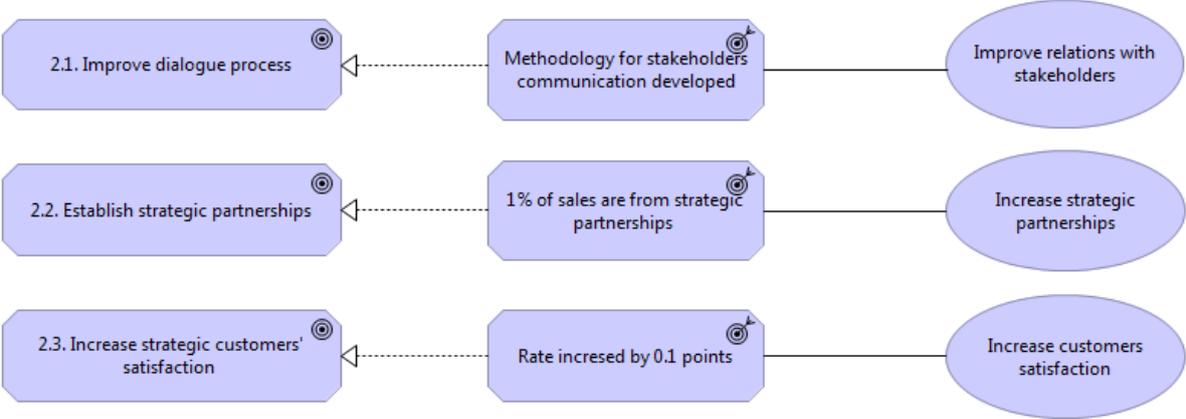


Figure 19 - Strategic objectives outcomes and their expected values.

Figure 20 represents the strategic objectives, outcomes and their expected values to DemoCorp. These strategic objectives measure the third strategic orientation, internationalization of DemoCorp's activity, driving DemoCorp to expand their products, services and activity to the international market.

To promote exports' growth, DemoCorp has to increase its exports sales volume by 10%. By doing so, DemoCorp will increase sales internationally. To increase the range of products sold/ services provided in the international market, DemoCorp must have 10% of its products/services being commercialized internationally. By doing so, DemoCorp will increase its international products/ services portfolio. To increase international visibility, DemoCorp's international presentations and initiatives must increase. By doing so, DemoCorp will internationalize its activity.

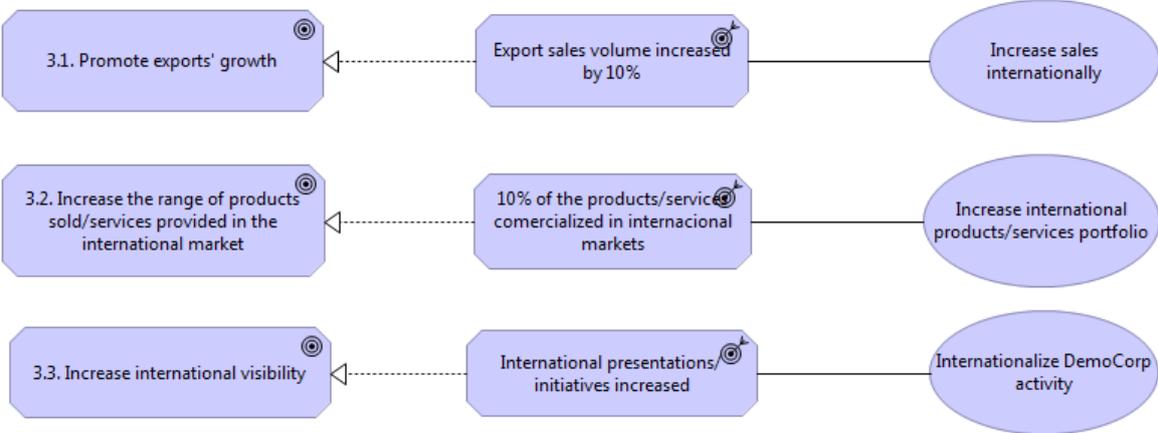


Figure 20 - Strategic objectives outcomes and their expected values.

Figure 21 represents the strategic objectives, outcomes and their expected values to DemoCorp. These strategic objectives measure the fourth strategic orientation, increase brand awareness and recognition, driving DemoCorp to increase its reputation, notoriety and visibility.

To increase reputation rate, DemoCorp has to improve it by 0.1 points. By doing so, DemoCorp will improve its relation with customers. To conduct a notoriety study, DemoCorp must develop it. By doing so, DemoCorp will evaluate its notoriety. To promote higher visibility and notoriety, the number of DemoCorp's activity references in the media must increase. By doing so, DemoCorp will increase its visibility and awareness.

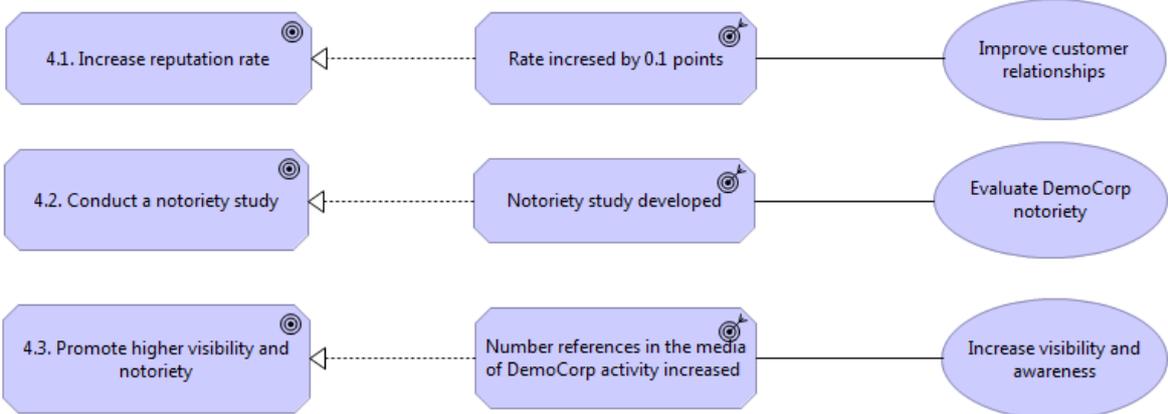


Figure 21 - Strategic objectives outcomes and their expected values.

Figure 22 represents the strategic objectives, outcomes and their expected values to DemoCorp. These strategic objectives measure the fifth strategic orientation, increase impact and recognition of DemoCorp's social intervention, driving DemoCorp to promote social responsibility and develop social initiatives.

To elaborate a Sustainability Agenda, DemoCorp has to develop and present it. By doing so, DemoCorp will promote sustainability. To promote social responsibility in several areas, DemoCorp has to fully execute its social responsibility budget. By doing so, DemoCorp will develop activities with social impact. To create social impact, DemoCorp has to realize a social initiative. By doing so, DemoCorp will increase activities with social impact.

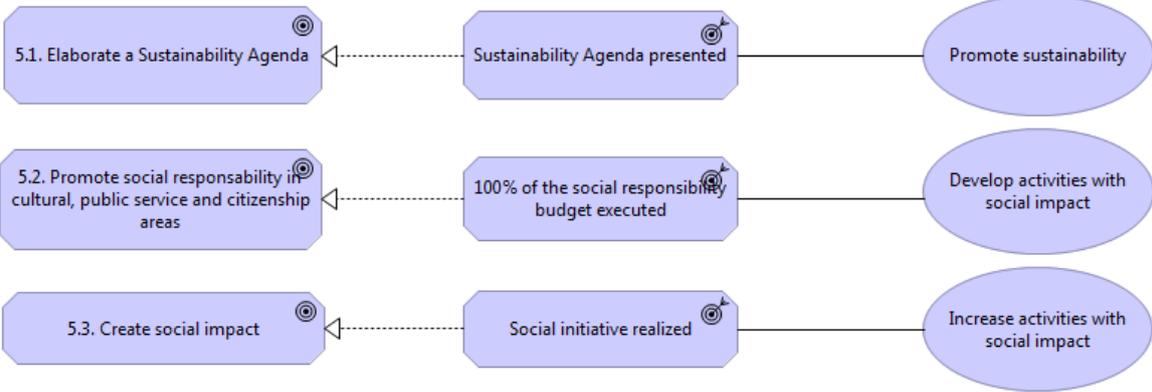


Figure 22 - Strategic objectives outcomes and their expected values.

Figure 23 represents the strategic objectives, outcomes and their expected values to DemoCorp. These strategic objectives measure the sixth strategic orientation, increase internal efficiency, driving DemoCorp to optimize its structure, processes and management culture.

To rationalize and optimize its structure and processes, DemoCorp must reduce its operating costs. By doing so, DemoCorp optimizes its processes and infrastructure. To reinforce business strategy, DemoCorp has to fully execute its strategic budget. By doing so, DemoCorp will increase strategic initiatives. To promote management culture and risk prevention, DemoCorp has to address four risk management scenarios. By doing so, DemoCorp will improve its risk management.

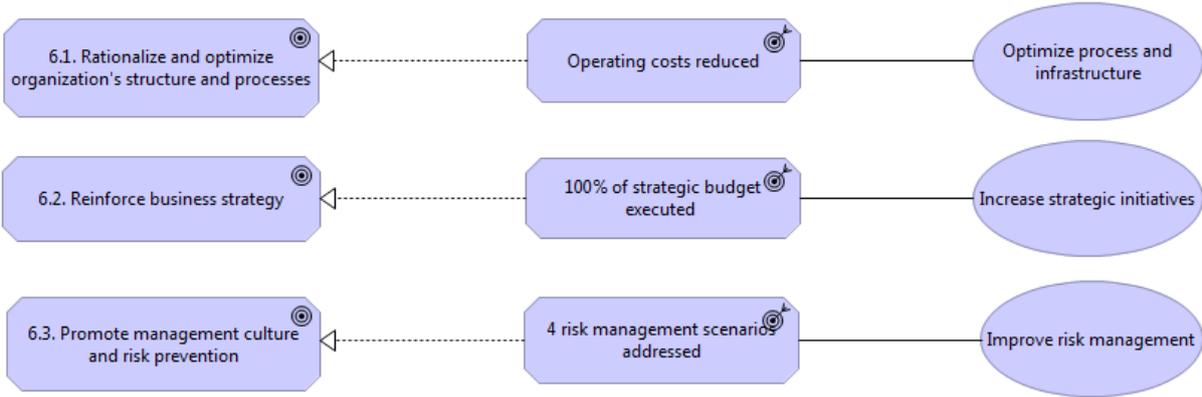


Figure 23 - Strategic objectives outcomes and their expected values.

Figure 24 represents the strategic objectives, outcomes and their expected values to DemoCorp. These strategic objectives measure the seventh strategic orientation, improve employee development, driving DemoCorp to improve organizational alignment and to reinforce its employees' competencies.

To improve organizational environment, DemoCorp's rate must increase. By doing so, DemoCorp will be able to improve it. To reinforce skills and learning process, DemoCorp has to present a plan for the competencies reduction gap. By doing so, DemoCorp will be able to reinforce employees competencies. To promote organizational alignment, all DemoCorp employees' objectives must be under contract. By doing so, DemoCorp will evaluate employees' performance.

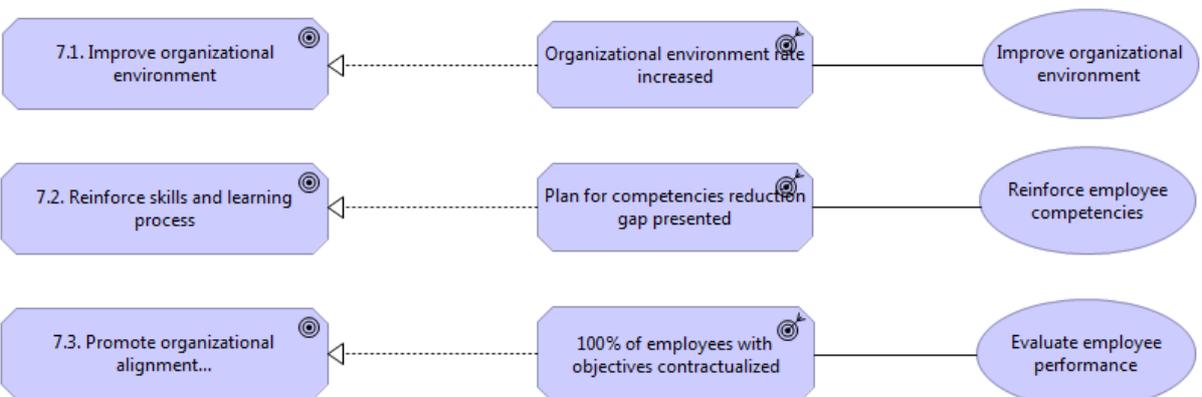


Figure 24 - Strategic objectives outcomes and their expected values.

In the figures above, we have identified, for every strategic objective and outcome represented in Step 1, the respective expected outcome value. Each outcome value is defined according to the business rule established in Section 4.

### 5.3. Step 3 – Identify organization’s projects.

To identify DemoCorp’s projects, we analyzed documentation regarding DemoCorp’s portfolio. As mentioned previously, DemoCorp has eight thematic programs with several projects associated and, to demonstrate the proposed solution, we selected projects from two thematic programs. Therefore, we identify in Figure 25 below, the projects selected and respective programs. We were able to identify all projects and programs, as well as, respective project owners. DemoCorp’s project owners are defined as organizational units. DemoCorp’s organization viewpoint is represented in Appendix A.

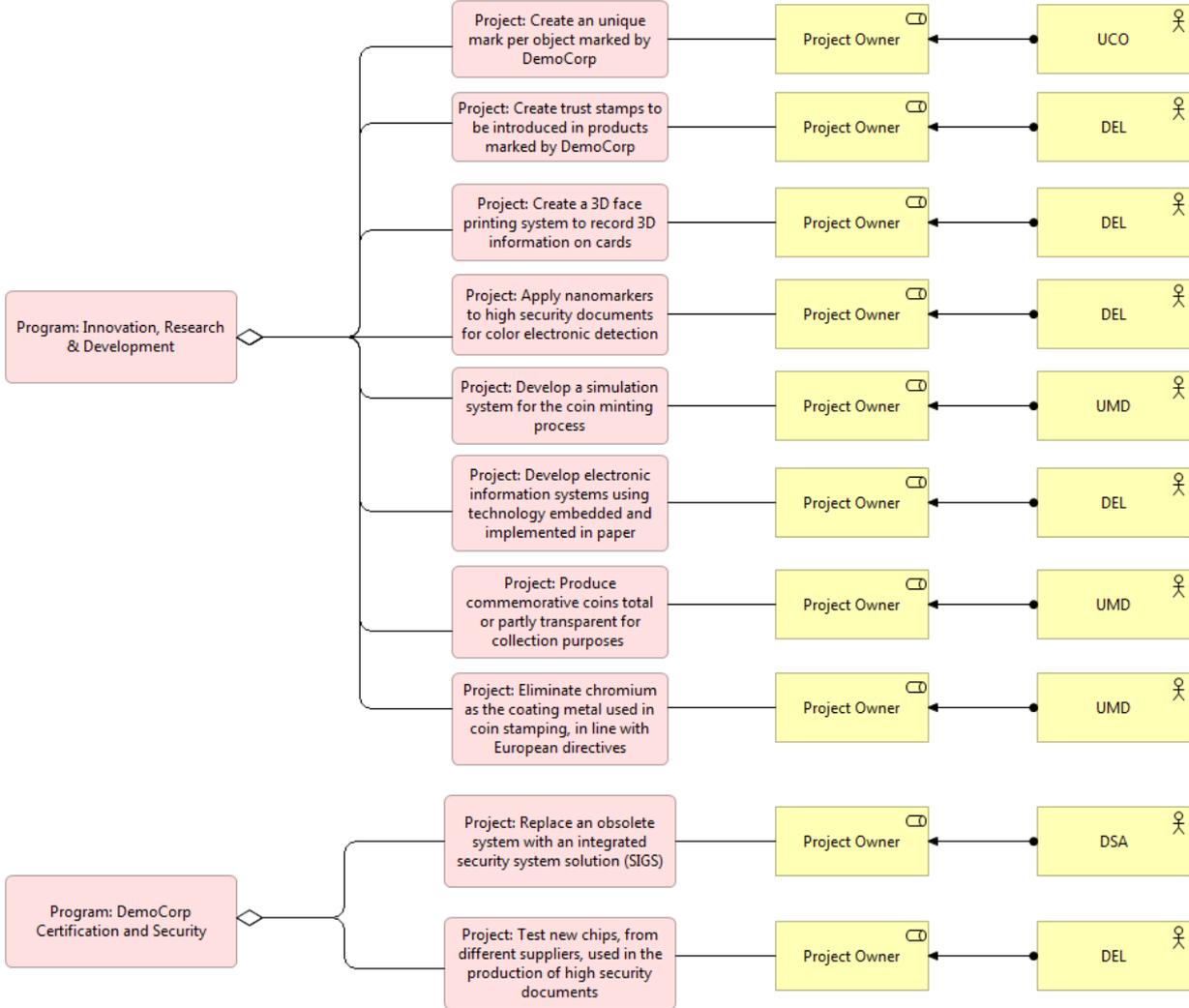


Figure 25 – DemoCorp’s projects identification viewpoint.

DemoCorp’s portfolio has around 74 ongoing projects of which we selected 10 projects. We considered that ten projects were enough to demonstrate our proposed solution. We were able to identify all ten projects and respective project owners, as well as, the programs associated with each project. Note that, in organizations that do not have a portfolio, there is no need to represent programs.

## 5.4 Step 4 - Represent projects and their expected values.

In this step, we analyze documentation regarding the scope and purpose of each project identified in Step 3, in order to identify each project expected value to DemoCorp.

As mentioned before, a project value is the utility or importance of that project to the organization and, to help identify it, we analyzed DemoCorp's documentation (e.g. Project Plan), where it is possible to find projects' scope and purpose.

The identification of projects' final product helps us define its expected value to the organization.

Projects with no information regarding their scope and purpose and with project owners unable to identify their expected value to the organization, are not suitable for the proposed method. Therefore, if we are not able to identify the expected value of a project, that project is not considered for the proposed method.

Using the generic template in Figure 13, we are able to represent projects' final product and define their expected value to the organization.

The following eight projects belong to DemoCorp Innovation, Research & Development Program. This program contains projects with similar purposes, to innovate and create new products and solutions to increase DemoCorp's products and services portfolio.

Figure 26 represents the **one mark** project, with the purpose of creating a unique mark per object. This project allows the marking of artefacts with a new and innovative security mechanism designed to authenticate and trace those artefacts. This new security mechanism will be incorporated within artefacts and provided externally to customers via DemoCorp's artefact marking service.

Using the business rule defined in the previous Section to describe the project value, we selected "develop" as the transitive verb, since this project creates, develops something new to the organization. As the complement to the verb we analyzed the product delivered, a new security mechanism. Therefore, the project value to the organization is to develop a new security mechanism.

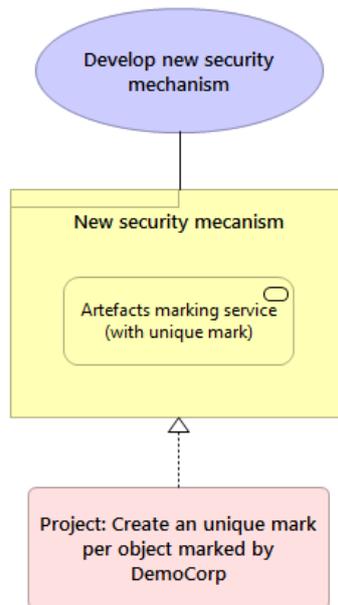


Figure 26 – DemoCorp’s one mark project and expected value.

Figure 27 represents the **stamps** project, with the purpose of creating stamps, a new security mechanism, to be incorporated in graphic products marked by DemoCorp. This new security mechanism is provided internally to the organization and externally to customers through DemoCorp’s graphic products manufacturing service. The stamps were designed to authenticate and trace those graphic products.

To define the project value, we selected “develop” as the transitive verb, since this project creates, develops something new to the organization. As the complement to the verb we analyzed the product delivered, a new security mechanism. Therefore, the project value to the organization is to develop a new security mechanism.

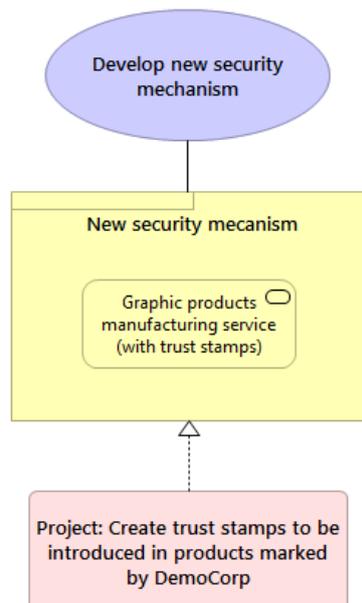


Figure 27 – DemoCorp’s stamps project representation and expected value.

Figure 28 represents the **3D** project, with the purpose of creating a 3D face printing system, a new security system that allows to record 3D information on cards. This new security system is provided internally to the organization and externally to customers through DemoCorp’s card production service with 3D information recorded.

To define the project value, we selected “develop” as the transitive verb, since this project creates, develops something new to the organization. As the complement to the verb we analyzed the product delivered, a new security system. Therefore, the project value to the organization is to develop a new security system.

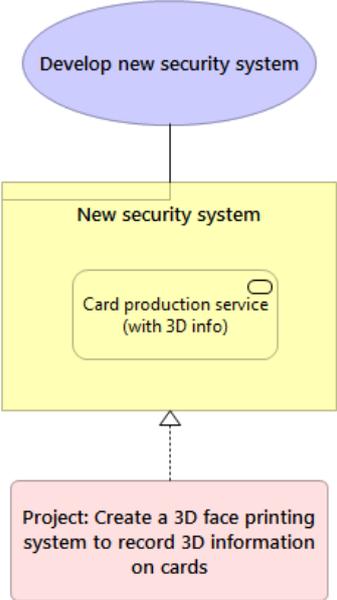


Figure 28 - DemoCorp’s 3D project representation and expected value.

Figure 29 represents the **nanomarkers** project, with the purpose of develop nanomarkers and apply them to high security documents as a new security mechanism for color electronic detection. This new security mechanism will be provided internally to the organization and externally to customers through DemoCorp’s manufacturing of graphic products service.

To define the project value, we selected “develop” as the transitive verb, since this project creates, develops something new to the organization. As the complement to the verb we analyzed the product delivered, a new security mechanism. Therefore, the project value to the organization is to develop a new security system.

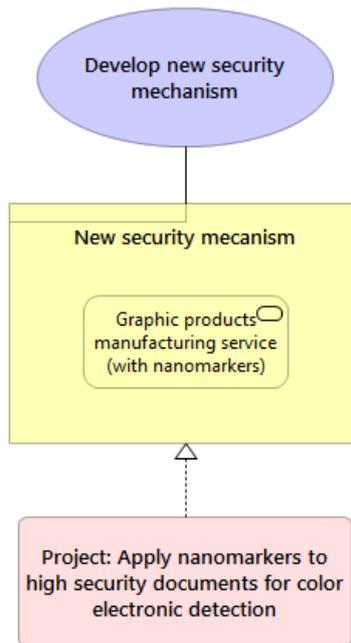


Figure 29 - DemoCorp's nanomarkers project representation and expected value.

Figure 30 represents the **simulation system** project, with the purpose of developing a simulation system used in the coin minting process. This project delivers a new simulation system to support the coin minting process, in order to detect flaws sooner and reduce costs and operations associated with it. Ultimately, this project optimizes DemoCorp's coin minting process.

To define the project value, we selected "optimize" as the transitive verb, since this project creates, develops something new to the organization. As the complement to the verb we analyzed the product delivered, a new simulation system for the coin minting process. Therefore, the project value to the organization is to optimize DemoCorp's coin minting process.

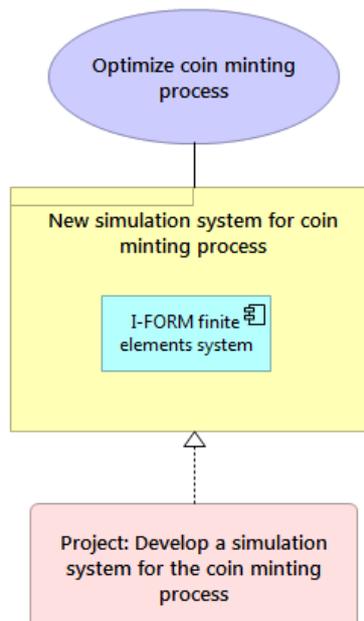


Figure 30 - DemoCorp's simulation system project representation and expected value.

Figure 31 represents the **paper** project, with the purpose of developing an electronic information system using technology embedded and implemented in paper. This project delivers a new security mechanism, in order to increase security and traceability mechanisms of DemoCorp’s products.

To define the project value, we selected “develop” as the transitive verb, since this project creates, develops something new to the organization. As the complement to the verb we analyzed the product delivered, a new security mechanism. Therefore, the project value to the organization is to develop a new security mechanism.

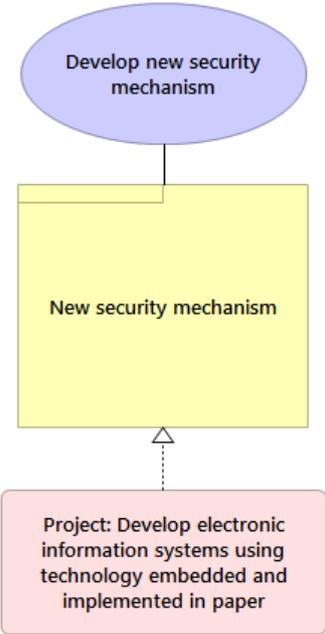


Figure 31 - DemoCorp’s paper project representation and expected value.

Figure 32 represents the **transparent coin** project, with the purpose of producing commemorative coins total or partly transparent for collection purposes. This project delivers a new commemorative coin, with innovative characteristics, to be produced and marked by DemoCorp.

To define the project value, we selected “develop” as the transitive verb, since this project creates, develops something new to the organization. As the complement to the verb we analyzed the product delivered, a new innovative product. Therefore, the project value to the organization is to develop a new innovative product.

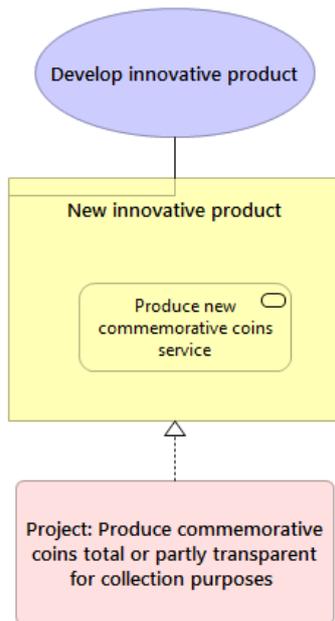


Figure 32 - DemoCorp's transparent coin project representation and expected value.

Figure 33 represents the **chromium** project, with the purpose of eliminating chromium as the coating metal used in the coin minting process to comply with European directives. This project provides a way to research alternative solutions to the chromium usage and find a new metal in line with the European directive.

To define the project value, we selected “comply” as the transitive verb, since this project originated to get DemoCorp to comply with an European directive. As the complement to the verb we analyzed the product delivered, a new metal approved by the directive. Therefore, the project value to the organization is to comply with European directives.

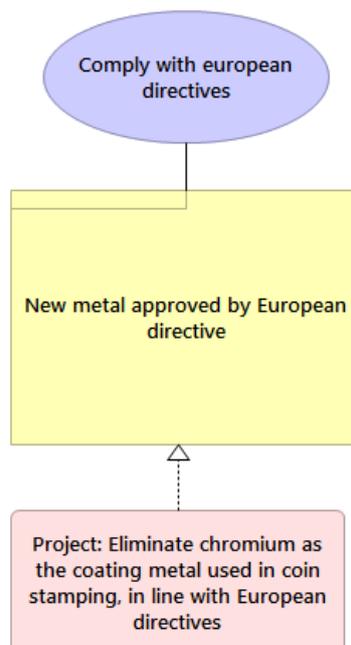


Figure 33 - DemoCorp's chromium project representation and expected value.

The following two projects belong to DemoCorp Certification and Security Program. This program contains projects with similar purposes, to provide DemoCorp with the necessary changes to obtain certifications, improving its business services and reputation among clients.

Figure 34 represents the **SIGS** project, with the purpose of replacing an obsolete system with an integrated security system. This project provides a new security and facility management system that optimizes DemoCorp’s security and facility management function.

To define the project value, we selected “optimize” as the transitive verb, since this project optimizes DemoCorp’s internal business functions. As the complement to the verb we analyzed the product delivered, a new security and facility management solution. Therefore, the project value to the organization is to optimize DemoCorp’s security and facilities management.

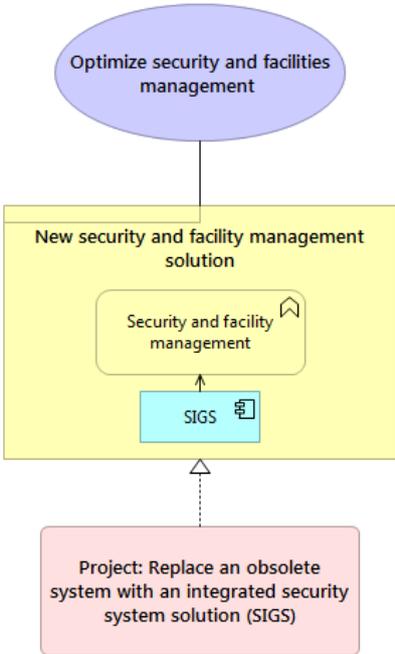


Figure 34 - DemoCorp’s SIGS project representation and expected value.

Figure 35 represents the **new chips** project, with the purpose of testing new chips, from different suppliers, to be applied in high security documents. With this project, DemoCorp will find a new chip supplier, allowing to continually search for new suppliers and solutions that improve DemoCorp core business.

To define the project value, we selected “promote” as the transitive verb, since this project promotes DemoCorp’s search for new suppliers and solutions. As the complement to the verb we analyzed the product delivered, a new chip supplier. Therefore, the project value to the organization is to promote suppliers’ competitiveness.

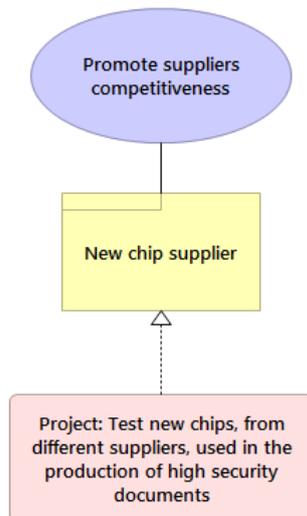


Figure 35 - DemoCorp's new chips project representation and expected value.

We have represented all ten projects from Step 3 and identified their expected value to DemoCorp. Each project value is defined according to the business rule established in Section 4.

These viewpoints are the input for the next step.

## 5.5.Step 5 – Identify the alignment between projects and strategic objectives.

In this step, we use the generic template in Figure 12 to represent the relation between each project and DemoCorp's strategic objectives. In this step, we analyze DemoCorp's outcomes values (output Step 2) and each project with its expected value (output Step 4).

A project expected value to DemoCorp can be in line with the outcome value associated to a strategic objective. By analyzing and comparing both values, we can identify the alignment between a specific project and DemoCorp's strategic objectives.

In Figure 36 below, we represent the **unique mark** project, its expected value to DemoCorp and the outcome values in line with the project value.

The project value is "Develop new security mechanism". By developing a new product, it is contributing to the diversity and increase of DemoCorp's product portfolio, which is in line with the "Diversify product portfolio" and "Increase product and service portfolio" values. These outcome values are associated with the following strategic objectives: "Promote research, technological development and innovation" and "Innovate products or services' offers".

If the value that a specific project has to the organization is similar/corresponds to the value that an outcome (that realizes the strategic objective) has to the organization, then we can conclude that project and that strategic objective are aligned and, therefore, that project contributes to the achievement of that strategic objective.

The one mark project value is similar/corresponds to the outcome value associated to the strategic objective 1.1 and 1.2. Therefore, we can conclude that the one mark project is in line with the strategic objectives 1.1 and 1.2.

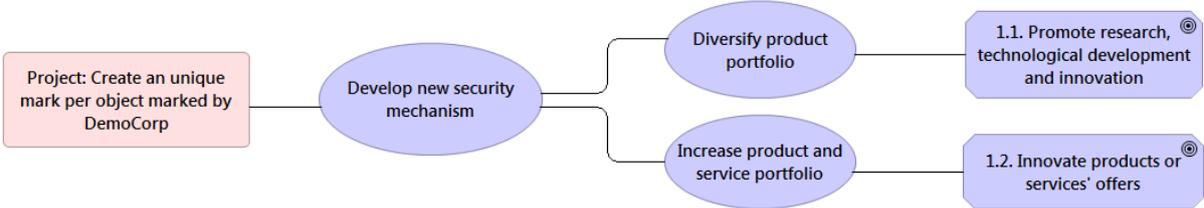


Figure 36 – Alignment between one mark project and DemoCorp’s strategic objectives.

In Figure 37 below, we represent the **stamps** project, its expected value to DemoCorp and the outcome values in line with the project value.

The project value is “Develop new security mechanism”. By developing a new product, it is contributing to the diversity and increase of DemoCorp’s product portfolio, which is in line with the “Diversify product portfolio” and “Increase product and service portfolio” values. These outcome values are associated with the following strategic objectives: “Promote research, technological development and innovation” and “Innovate products or services’ offers”.

The stamps project value is similar/corresponds to the outcome value associated to the strategic objective 1.1 and 1.2. Therefore, we can conclude that the stamps project contributes to the achievement of strategic objectives 1.1 and 1.2.

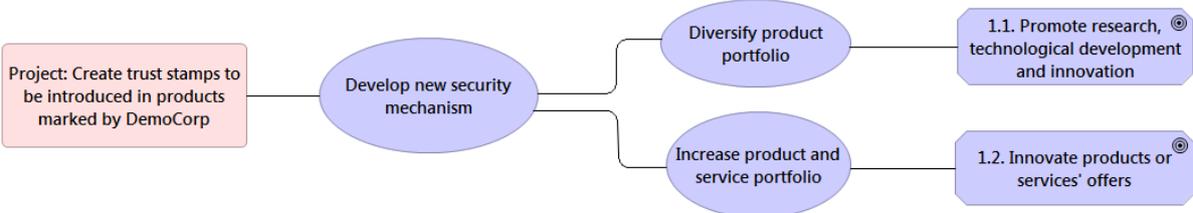


Figure 37 – Alignment between stamps project and DemoCorp’s strategic objectives.

In Figure 38 below, we represent the **3D** project, its expected value to DemoCorp and and the outcome values in line with the project value.

The project value is “Develop new security system”. By developing a new product, it is contributing to the diversity and increase of DemoCorp’s product portfolio, which is in line with the “Diversify product portfolio” and “Increase product and service portfolio” values. These outcome values are associated with the following strategic objectives: “Promote research, technological development and innovation” and “Innovate products or services’ offers”. The 3D project value is similar/corresponds to the outcome value associated to the strategic objective 1.1 and 1.2. Therefore, we can conclude that the 3D project is in line with the strategic objectives 1.1 and 1.2.

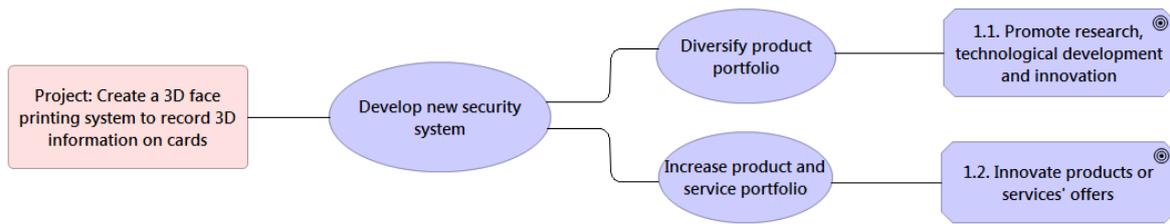


Figure 38 - Alignment between 3D project and DemoCorp's strategic objectives.

In Figure 39 below, we represent the **nanomarkers** project, its expected value to DemoCorp and the outcome values in line with the project value.

The project value is “Develop new security mechanism”. By developing a new product, it is contributing to the diversity and increase of DemoCorp’s product portfolio, which is in line with the “Diversify product portfolio” and “Increase product and service portfolio” values. These outcome values are associated with the following strategic objectives: “Promote research, technological development and innovation” and “Innovate products or services’ offers”.

The nanomarker project value is similar/corresponds to the outcome value associated to the strategic objective 1.1 and 1.2. Therefore, we can conclude that the nanomarkers project contributes to the achievement of strategic objectives 1.1 and 1.2.

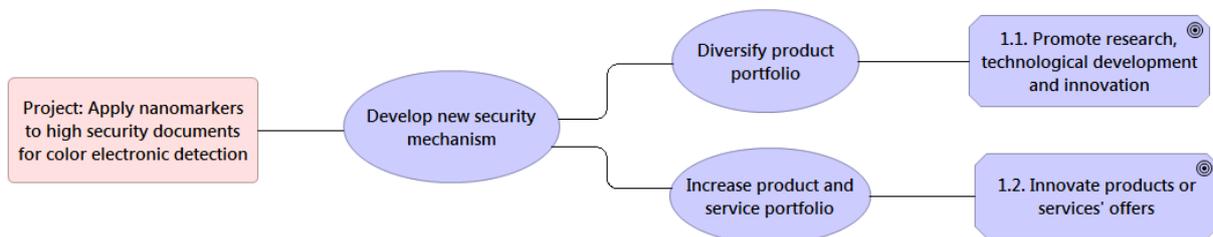


Figure 39 – Alignment between nanomarkers project and DemoCorp's strategic objectives.

In Figure 40 below, we represent the **simulation system** project, its expected value to DemoCorp and the outcome values in line with the project value.

The project value is “Optimize coin minting process”. By optimizing a DemoCorp’s process, it is in line with the “Optimize process and infrastructure” value. This outcome value is associated with the “6.1. Rationalize and optimize organization’s structure and processes” strategic objective.

The simulation system project value is similar/corresponds to the outcome value associated to the strategic objective 6.1. Therefore, we can conclude that the simulation system project contributes to the achievement of strategic objective 6.1.



Figure 40 – Alignment between simulation system project and DemoCorp's strategic objectives.

In Figure 41 below, we represent the **paper** project, its expected value to DemoCorp and the outcome values in line with the project value.

The project value is “Develop new security mechanism”. By developing a new product, it is contributing to the diversity and increase of DemoCorp’s product portfolio, which is in line with the “Diversify product portfolio” and “Increase product and service portfolio” values. These outcome values are associated with the following strategic objectives: “Promote research, technological development and innovation” and “Innovate products or services’ offers”.

The paper project value is similar/corresponds to the outcome value associated to the strategic objective 1.1 and 1.2. Therefore, we can conclude that the paper project contributes to the achievement of strategic objectives 1.1 and 1.2.

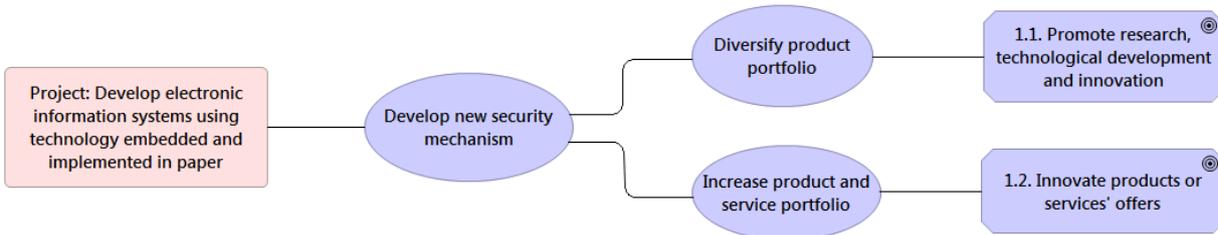


Figure 41 - Alignment between paper project and DemoCorp’s strategic objectives.

In Figure 42 below, we represent the **transparent coin** project, its expected value to DemoCorp and the outcome values in line with the project value.

The project value is “Develop innovative product”. By developing an innovative product, it is contributing to the diversity and increase of DemoCorp’s product portfolio, which is in line with the “Diversify product portfolio” and “Increase product and service portfolio” values. These outcome values are associated with the following strategic objectives: “Promote research, technological development and innovation” and “Innovate products or services’ offers”.

The transparent coin project value is similar/corresponds to the outcome value associated to the strategic objective 1.1 and 1.2. Therefore, we can conclude that the transparent coin project contributes to the achievement of strategic objectives 1.1 and 1.2.

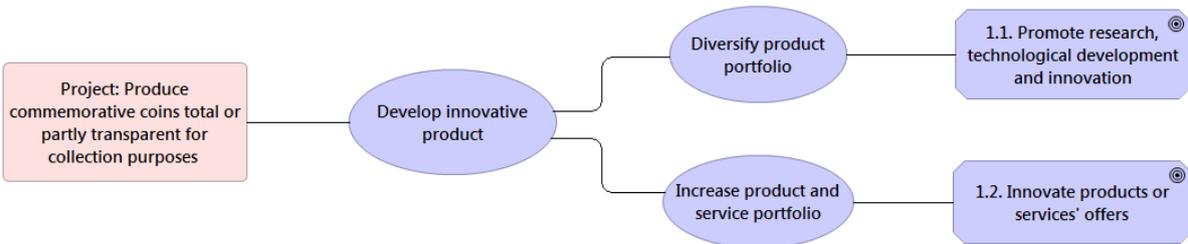


Figure 42 - Alignment between transparent coin and DemoCorp’s strategic objectives.

In Figure 43 below, we represent the **chromium** project, its expected value to DemoCorp and the outcome values in line with the project value.

The project value is “Comply with European directives”. This project was created in order to comply with an European directive regarding the environment and public health. By analyzing all outcome values from Step 2, we were not able to find one that would be in line with this project value. Therefore, we can conclude that the chromium project does not contribute to the achievement of DemoCorp’s strategic objectives.

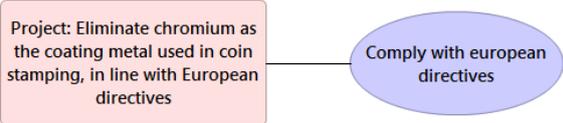


Figure 43 - Alignment between chromium project and DemoCorp’s strategic objectives.

In Figure 44 below, we represent the **SIGS** project, its expected value to DemoCorp and the outcome values in line with the project value. SIGS is an integrated system solution that optimizes DemoCorp’s security and facilities management functions.

The project value is “Optimize security and facilities management”. By optimizing a DemoCorp’s function, it is in line with the “Optimize process and infrastructure” value. This outcome value is associated with the “6.1.Rationalize and optimize organization’s structure and processes” strategic objective.

The SIGS project value is similar/corresponds to the outcome value associated to the strategic objective 6.1. Therefore, we can conclude that the SIGS project contributes to the achievement of strategic objective 6.1.

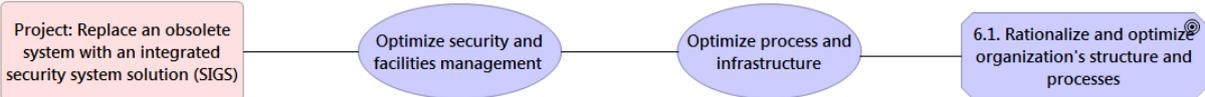


Figure 44 - Alignment between SIGS project and DemoCorp’s strategic objectives.

In Figure 45 below, we represent the **new chips** project, its expected value to DemoCorp and the outcome values in line with the project value.

The project value is “Promote suppliers’ competitiveness”. This project was created in order to explore and test new suppliers and their solutions. By analyzing all outcome values from Step 2, we were not able to find one that would be in line with this project value. Therefore, we can conclude that the new chips project does not contribute to the achievement of DemoCorp’s strategic objectives.

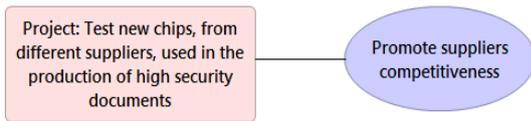


Figure 45 – Alignment between new chips project and DemoCorp’s strategic objectives.

As referred previously, the output of this step is the identification of the alignment between DemoCorp’s projects and its strategic objectives. The **Innovation, Research & Development** program has eight projects and the **DemoCorp Certification and Security** program has two projects, whose expected value to DemoCorp influences the achievement of three different strategic objectives.

However, there are two projects, one in each program, not aligned with DemoCorp’s strategic objectives.

The projects in the same program, despite not having the same scope, have similar objectives, i.e. 75% of projects in the Innovation, Research & Development program promote research and development of innovative products and services. Therefore, it is expected that projects within the same program are often in line with the same strategic objectives.

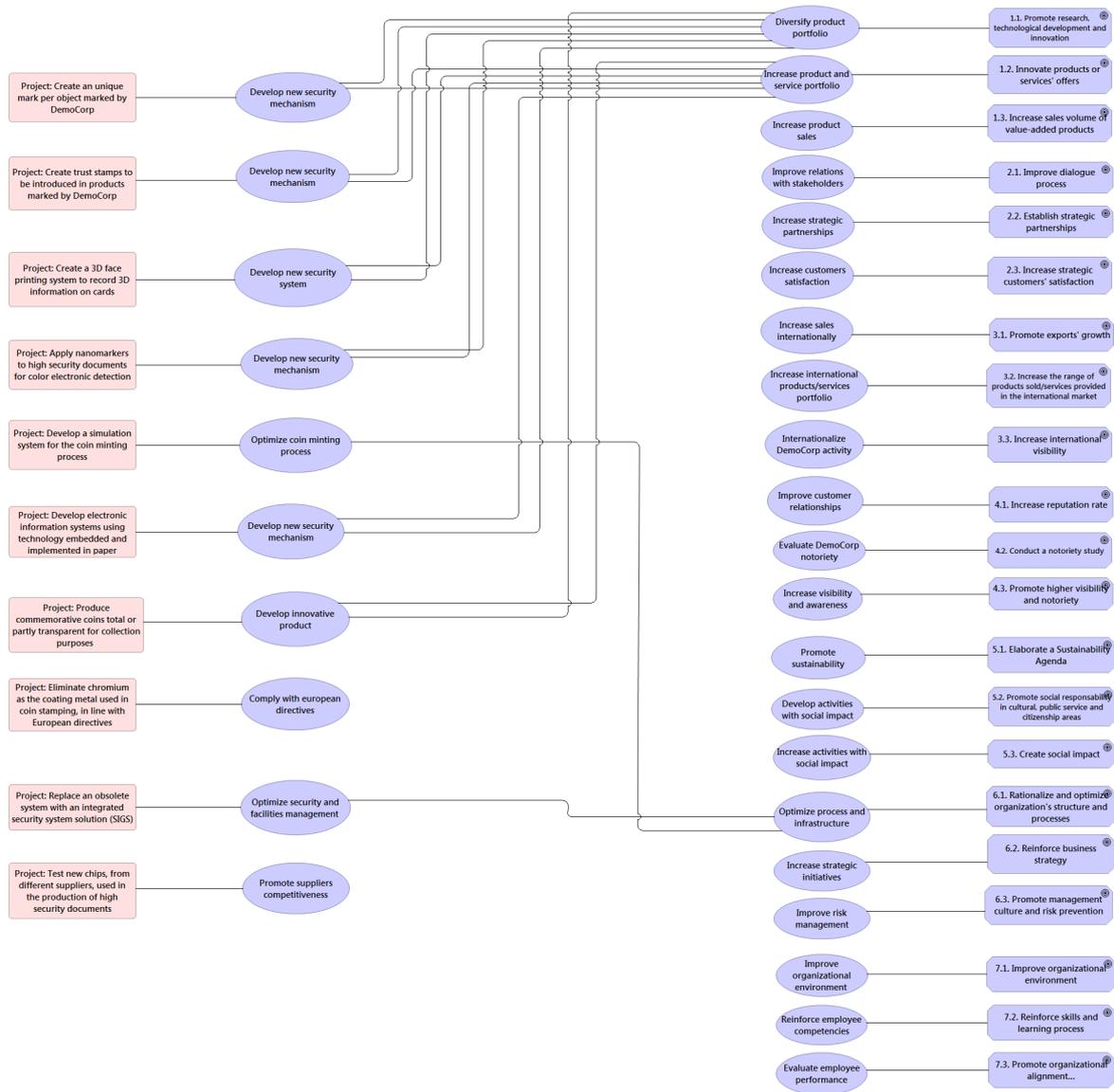


Figure 46 – Overall alignment identification between DemoCorp's ten projects and strategic objectives.

Figure 46 represents the overall viewpoint of DemoCorp's alignment identification between all ten projects and twenty-one strategic objectives.

By analyzing Figure 46 and the previous ones, we can conclude that for all ten projects selected to demonstrate the proposed solution, we were able to identify their expected value to DemoCorp. We can also conclude that eight out of those ten projects expected values are in line with three outcome values (associated to 3 different strategic objectives) and two projects are not aligned with DemoCorp's strategic objectives.

# 6. Evaluation

This section corresponds to the evaluation activity of DSRM process model [13]. The evaluation activity aims to observe and measure how well the artifacts support a solution to the research problem. It intends to compare the objectives of a solution to actual observed results from use of the artifacts presented in the Section 5.

The evaluation of this work was accomplished by using the demonstration scenario at one government owned company, named DemoCorp (field study) in this research work.

In order to evaluate the proposed solution, we use the following approach:

- Analyze DemoCorp's alignment identification between its projects and strategy before and after applying the proposed solution;
- Compare both scenarios identified in the analysis above, in order to establish if, with the proposed solution, we were able to add or improve quality and quantity of the alignment information between DemoCorp's projects and strategic objectives.

The selected projects (ten projects) represent a sample of DemoCorp's ongoing projects in the portfolio. Although restrictive, this sample has proven to be sufficient to verify our proposed solution's applicability by presenting both possible scenarios: projects aligned with at least one strategic objective and projects not aligned with strategic objectives. Therefore, when evaluating the proposed solution, we use all ten projects selected as DemoCorp's ongoing projects in the portfolio.

## 6.1. Before applying the proposed solution

As mentioned before, our proposed solution was demonstrated in DemoCorp, a mid-sized government owned company, with a Project Management Office (PMO) unit that ensures the monitoring of its various programs and projects, in order to increase DemoCorp's efficiency in executing them. This organizational unit has the following objectives:

- Promote organizational alignment, increasing DemoCorp's programs and projects development efficiency;
- Qualify and quantify programs and projects' benefits for the achievement of DemoCorp's strategic objectives;
- Provide DemoCorp with a structure to control and monitor ongoing and planned investments.

The creation of a PMO in DemoCorp arose awareness to the need of aligning DemoCorp's projects and its strategic objectives. Organizations tend to evaluate the achievement of their strategic objectives using strategic tools and methods that, quite often, focus just on establishing measures to assess if either the objective was accomplished or not.

Projects are strategic initiatives that can help organizations improve their strategy definition process and, consequently, improve their strategic objectives definition and achievement.

In an attempt to establish that relation, DemoCorp introduced in the project plan template an entry field named “Alignment with DemoCorp strategy” to be completed by the project manager. However, it is an open answer field and not mandatory, meaning that it is rarely filled in and considered when selecting and prioritizing projects.

DemoCorp’s PMO evaluates the schedule, scope, risks, costs, investments and the schedule performance index (SPI) of all its ongoing projects. These indicators allow to measure if projects are in line with the planned timeline, budget and expected value delivery established early on.

The PMO established a correlation between each project and DemoCorp’s strategic orientations and its strategic context. These are the only two indicators that provide information about projects alignment with DemoCorp’s strategy. This relation is established by a PMO employee based on his/hers interpretation of the projects’ scope and purpose.

<b>Projects</b>	<b>Strategic Context</b>	<b>Strategic Orientation</b>
<b>One Mark</b>	Increase the value chain	1.Supply Innovation
<b>Stamps</b>	Increase the value chain	1.Supply Innovation
<b>3D</b>	Increase the value chain	1.Supply Innovation
<b>Nanomarkers</b>	Increase the value chain	1.Supply Innovation
<b>Paper</b>	Increase the value chain	1.Supply Innovation
<b>Simulation System</b>	Increase the value chain	1.Supply Innovation
<b>Transparent Coin</b>	Increase the value chain	1.Supply Innovation
<b>Chromium</b>	Increase the value chain	1.Supply Innovation
<b>SIGS</b>	Institutional	5.Human Capital
<b>New Chips</b>	Increase the value chain	6.Internal Efficiency

Table 2 – Relation between DemoCorp’s projects and its strategy before the proposed solution.

Therefore, even with the effort to establish that relation, we were not able to find information relating DemoCorp’s projects and its strategic objectives.

This master thesis derives from that need to identify which projects are aligned with which DemoCorp’s strategic objectives. Our proposed solution satisfies this need by identifying how to relate both subjects.

## 6.2. After applying the proposed solution

We applied our proposed solution to ten projects (in the portfolio), in order to identify which projects are in line with DemoCorp’s strategic objectives.

We analyzed a total of 10 projects from 2 programs of DemoCorp’s portfolio. After completing the Demonstration in Section 5, we concluded that **8 projects are aligned with 3 different strategic objectives** through their expected values and that 2 projects are not aligned.

After applying the proposed solution, we were able to identify every projects expected value to DemoCorp. Through that value, we were able to identify if a certain project is in line with DemoCorp’s strategic objectives. We were also able to identify if a certain project is not aligned.

Before the proposed method, the PMO identified for each project, its strategic context and strategic orientation, as represented in Table 2.

With the proposed solution, we were able to add two more indicators, projects value and strategic objectives as represented in Table 3 below.

Projects	Project Value	Strategic Context	Strategic Orientation	Strategic Objective
One Mark	Develop new security mechanism	Increase the value chain	1.Supply Innovation	1.1. Promote research, technological development and innovation.
				1.2. Innovate products or services' offers
Stamps	Develop new security mechanism	Increase the value chain	1.Supply Innovation	1.1. Promote research, technological development and innovation.
				1.2. Innovate products or services' offers
3D	Develop new security system	Increase the value chain	1.Supply Innovation	1.1. Promote research, technological development and innovation.
				1.2. Innovate products or services' offers
Nanomarkers	Develop new security mechanism	Increase the value chain	1.Supply Innovation	1.1. Promote research, technological development and innovation.

				1.2. Innovate products or services' offers
<b>Paper</b>	Develop new security mechanism	Increase the value chain	1.Supply Innovation	1.1. Promote research, technological development and innovation.
				1.2. Innovate products or services' offers
<b>Simulation System</b>	Optimize coin minting process	Increase the value chain	6.Internal Efficiency	6.1. Rationalize and optimize organization's structure and processes
<b>Transparent Coin</b>	Develop innovative product	Increase the value chain	1.Supply Innovation	1.1. Promote research, technological development and innovation.
				1.2. Innovate products or services' offers
<b>Chromium</b>	Comply with European directives	Increase the value chain	1.Supply Innovation	Project not in line with strategic objectives
<b>SIGS</b>	Optimize security and facilities management	Institutional	6.Internal Efficiency	6.1. Rationalize and optimize organization's structure and processes
<b>New Chips</b>	Promote suppliers competitiveness	Increase the value chain	6.Internal Efficiency	Project not in line with strategic objectives

Table 3 - Relation between DemoCorp's projects and its strategy after the proposed solution

As mentioned in Section 6.1, before applying the proposed solution, the relation between projects and DemoCorp's strategy was identified by a PMO employee based on his/hers interpretation of the projects' scope and purpose and knowledge of all projects in the portfolio.

As mentioned previously, 2 of the 10 projects analyzed are not in line with DemoCorp's strategic objectives. Although, PMO identified a relation between both projects and DemoCorp's strategic orientations, with the proposed solution, we could not establish a relation between the **chromium** and **new chips** projects and DemoCorp's strategic objectives.

We identified that the Simulation System and SIGS projects are in line with the *6.1. Rationalize and optimize organization's structure and processes* strategic objective. This objective measures the *6. Internal Efficiency* strategic orientation. In Table 2, the strategic orientations associated with these projects are *1. Supply Innovation* and *5. Human Capital*, respectively. Therefore, we proposed the alteration of both strategic orientations with the strategic orientation identified with the proposed solution, as represented in Table 3.

Therefore, with the proposed solution applied, we were able to identify which selected projects are in line with DemoCorp's strategic objectives, as well as, their expected value. This analysis contributed positively to DemoCorp, since we were able to improve the quality and quantity of information regarding projects and DemoCorp's strategic objectives.

By following the proposed solution, it will be possible for the organization to continue identifying if an ongoing project is in line with its strategic objectives.

# 7. Communication

The communication section corresponds to the communication activity of the DSRM process model [13].

In this Section, we aim to communicate the problem and its importance, the artifact, its utility and novelty, the rigor of its design and its effectiveness to researchers and other relevant audience [13]. Moreover, this communication activity tests the acceptance of the research work outcomes, which provides information about the proposed work, the problem's importance, the solution objective's viability, the artifact's utility and the outcomes' value.

This research work was shared with DemoCorp, the field study company, by having the proposed method applied to its particular case.

To communicate our work, we have submitted two papers to the following conferences:

- **20<sup>th</sup> International Conference on Enterprise Information Systems (ICEIS 2018)**. The paper proposes our method to identify the alignment between an organization's projects and its strategic objectives using ArchiMate as the modeling language.

## 8. Conclusion

The alignment between projects and programs with an organization's strategy have become an essential part of navigate in an increasingly competitive market environment. The fact is that without the right projects and programs to carry it out, even the most forward-thinking strategies can fail.

Organizations use strategy models, methods, frameworks as tools to formulate and analyze strategies, goals and objectives. These tools tend to narrow the organization focus on establishing measures to assess if strategic objectives are accomplished or not, lacking the definition of actions and initiatives to do so. Therefore, the increasing complexity of issues involved, as well as, the growing diversity and heterogeneity of concerns and stakes of involved stakeholders, render these preexisting approaches less adequate.

The related work provided information on key subjects and concepts, such as organizational alignment, projects and strategic elements relevant to the research problem, as well as, enterprise architecture, essential to design the proposed solution.

Enterprise Architecture offers a holistic perspective of the organization's current and future operations, and on the actions that should be taken to achieve its goals. Each stakeholder requires specific information presented in an accessible form and ArchiMate, as the standard language for the graphical modelling of EA, provides viewpoints that are a means to focus on particular aspects of the architecture, allowing to represent the proposed solution in a coherent and detailed way.

After the analysis of the related work, we formulated the research problem, as a search for a solution on how to identify the alignment between an organization's projects and its strategic objectives using ArchiMate as the modeling language.

ArchiMate allows us to model an organization's strategic objectives, projects and their expected value to the organization, as well as, represent others elements of an organization's architecture. It also allows to model relations between these concepts. In Section 4, we presented the proposed solution steps and viewpoints used to identify the alignment between an organization's projects and strategic objectives.

The proposed solution was applied in DemoCorp, a government owned company. We able to model DemoCorp's strategic elements and projects using ArchiMate and identify the expected value of a project and an achieved target to DemoCorp. Finally, we were able to identify and model a correlation between DemoCorp's projects expected values and its strategic objectives. We provided an effective solution that addresses the research problem and enables organizations to identify such alignment.

We can conclude that the proposed method help organizations identify which projects can contribute to the achievement of their strategic objectives. These initiatives and activities provide products and services with purpose to the organization, e.g. to satisfy customers' needs and optimize processes. The purpose and value of these initiatives to the organization can be and, quite often are, in line with its strategic objectives.

## 8.1. Contributions

In this sub-section, we summarize our dissertation contributions to the practice and knowledge base.

The main research contribution is the development of a method for identifying the alignment between an organization's projects and strategic objectives using ArchiMate. The proposed solution comprises 5 steps with the following features:

- A viewpoint to identify and model an organization's strategic objectives and outcomes, i.e. achieved targets (Step 1);
- A viewpoint to identify and model strategic outcomes expected values (Step 2);
- A viewpoint to identify and model an organization's projects (Step 3);
- A viewpoint to represent projects and their expected values (Step 4);
- A viewpoint to identify and represent an organization's alignment between projects (and their expected values) and its strategic objectives (Step 5).

Our proposed solution was based on ArchiMate language (version 3.0) and its efficacy and utility was validated in one government owned company.

## 8.2. Limitations

This research work has few limitations that need to be addressed.

The main limitation of our research work is the proposed method only allows to identify that a certain project is in line with a certain strategic objective, i.e. that a project contributes to the achievement of a strategic objective. The proposed method does not provide a way to quantify that relation between projects and strategic objectives.

Also, the proposed solution can only be applied to projects in which is possible to clearly identify their expected value to the organization;

The method is not a stand-alone tool, it requires knowledge about the organization where it is to be implemented and about the language used to model every step;

This proposal focuses mainly on the Motivation and Implementation and Migration extensions.

Finally, this method does not provide a connection with other tools and methods used to measure strategic objectives within organizations.

### **8.3. Future work**

There is plenty of research that can be done based on this thesis and its outcomes.

Having established the relation between an organization's projects and strategic objectives, a future work would be to quantify how much each project contributes to the achievement of the aligned strategic objectives.

Also, since both expected values are defined through business rules, the process of identifying the alignment could be automatized if more elements were defined accordingly. The proposed solution automation would allow the development of an alarm model to identify deviations from meeting strategic objectives. The development of a technological tool that allows the introduction and visualization of the alignment between projects and strategic objectives achievement would follow.

Identify how to link strategic objectives (their intermediate targets) throughout the whole project life cycle.

Linking strategic objectives to operational objectives, would allow to identify how certain projects can be aligned with operational objectives;

Demonstrate and evaluate the method in more government owned companies, as well as, in private sector organizations, eventually comparing the results with those obtained in the public sector domain.

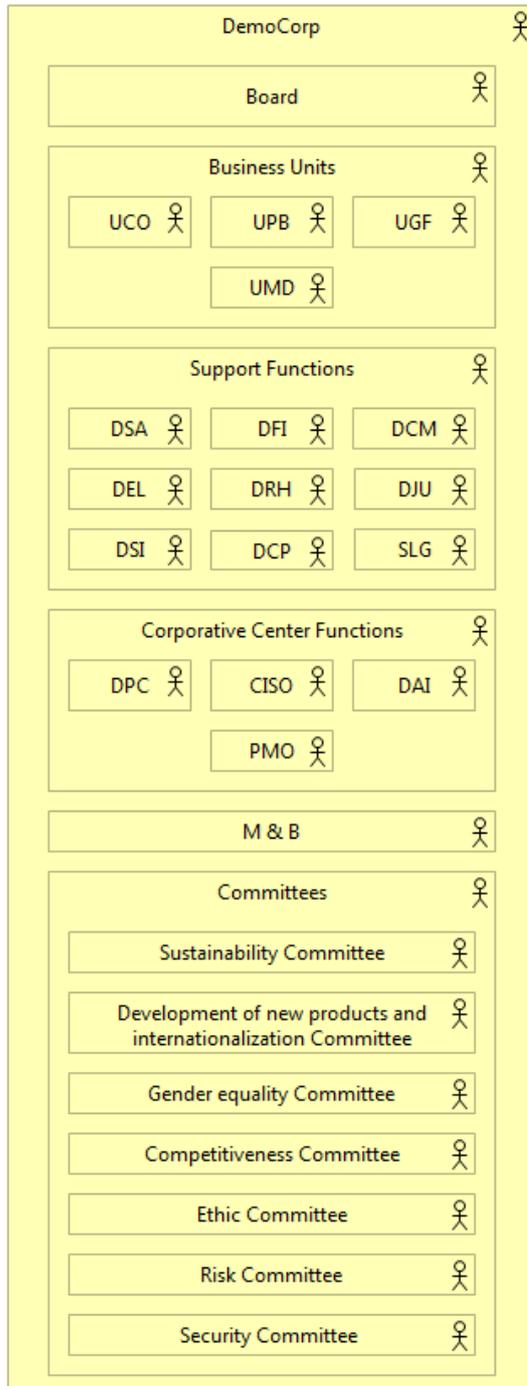
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# Appendixes

## Appendix A: DemoCorp



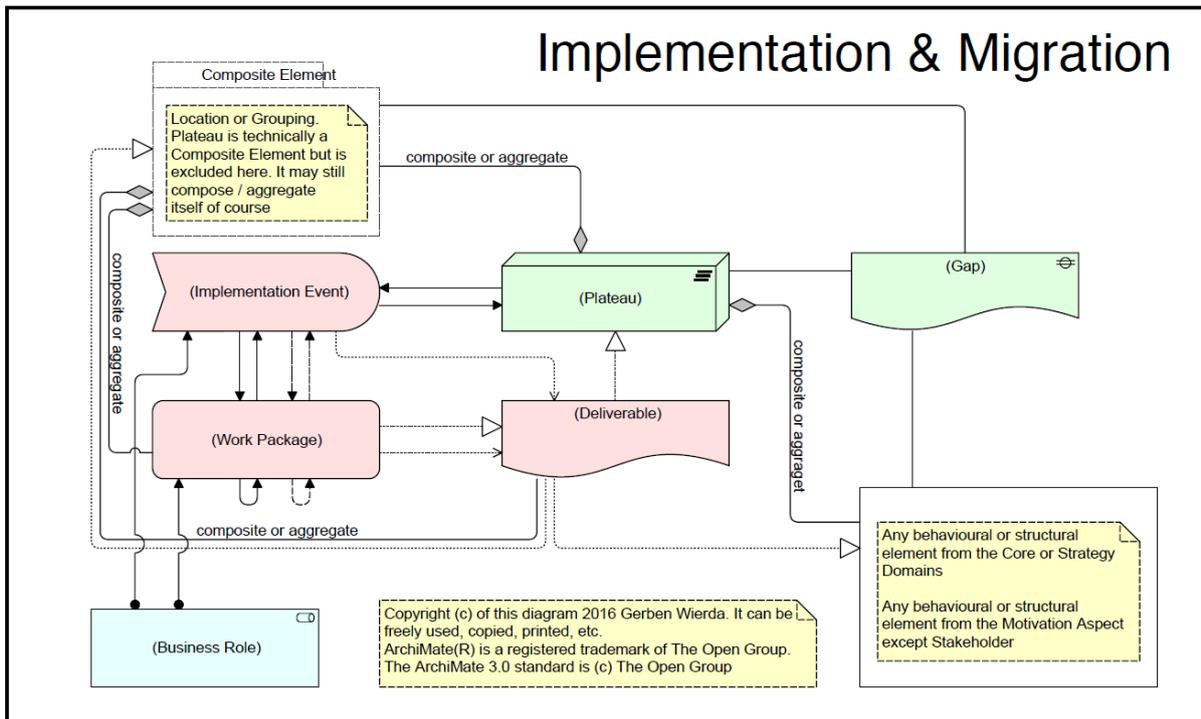
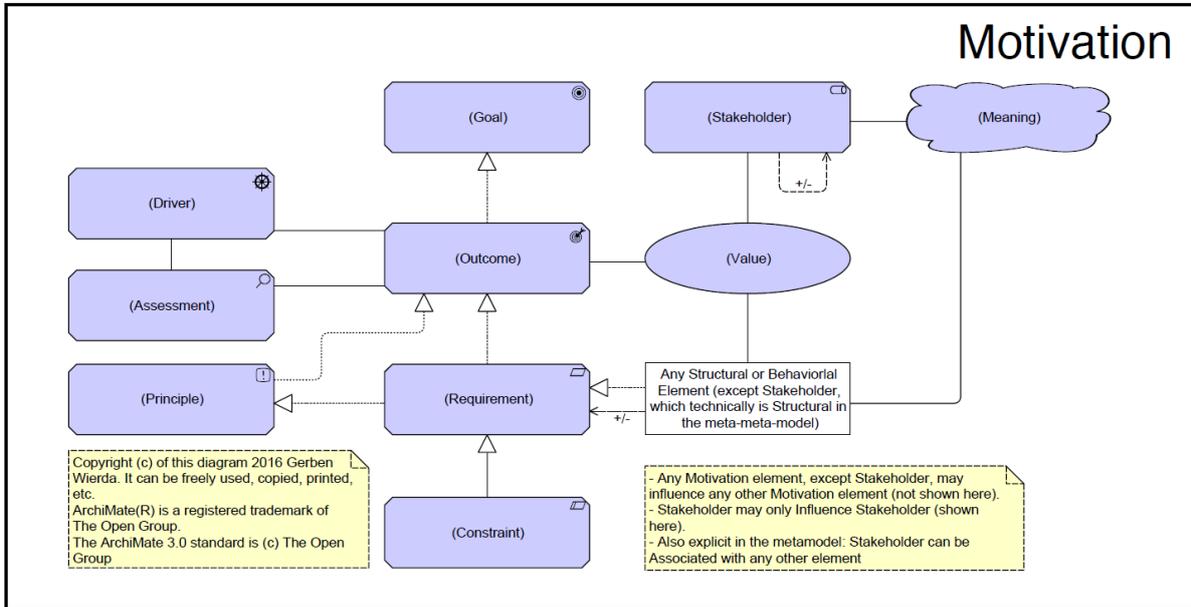
UCO - Assay Unit  
 UPB - Publications Unit  
 UGF - Secure Printing Unit  
 UMD - Mint Unit

DSA - Security and General Support Direction  
 DFI - Financial Direction  
 DEL - Engineering and Laboratories Direction  
 DRH - Human Resources Direction  
 DCM - Commercial and Marketing Direction  
 DJU - Legal Services Direction  
 DSI - Information System Direction  
 DCP - Procurement Direction  
 SLG - Logistics Service

DPC - Planning and Management Control Direction  
 DAI - Internal Auditing and Risk Management Direction  
 CISO - Chief Information Security Officer

M & B - Museum and Library

## Appendix B: ArchiMate 3.0 Metamodel – Non-Core elements



# Appendix C: ArchiMate 3.0 Metamodel – Core elements and relations

