

TDT4252 - ENTERPRISE ARCHITECTURE FOR ENTERPRISE
INNOVATION

The Case of Sentimate

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1 Introduction

This section provides an overview of the project, introducing the case study on Sentimate, an innovative Software as a Service (SaaS) startup, and explaining the purpose of the developed model. The focus is on understanding the dependencies between Sentimate and a general company aiming to achieve a **synergetic wellness model**, which includes both the sentiments and thoughts of employees as well as the workload of the HR department.

1.1 Case description

The chosen case is on Sentimate, a Software as a Service (SaaS) innovative Italian startup, developing during the second semester of the first year of my master's degree (2023-2024) with my teammates at the University of Trento (Italy). Currently in its launch phase, Sentimate is looking for stakeholders interested in this software solution. Nowadays, companies are increasingly looking for innovative solutions to optimize hiring, improve employee engagement, and make efficiently the processes of the HR department. To address this need, Sentimate aims to develop AI-driven software to foster workplace well-being for companies, seeking to implement a holistic synergy wellness model.

The problem is that traditional HR processes struggle to keep up with the needs of today's large companies, often failing to understand and support employees' emotions, dynamics within teams, and recruitment as well as matching processes inefficiencies. The solution is a **workplace wellbeing-centric AI assistant** that uses in-real time information to help the employee, better distribute people and workloads in the company. Aiding HR in the recruiting and group forming processes, taking into account not only the technical skills of workers but also their feelings and emotions.

In the report, at the beginning, a description of the situation in a general company is provided in Section 2 without the implementation of Sentimate software. Then, the final view of the model is presented in Section 5, showing the scenario where Sentimate is employed.

1.2 Purpose of the Model

The model is designed to address one of the typical business challenges identified by Sandkhul et al. [1]. In particular, this model helps to **understand organizational dependencies** of Sentimate. According to Sandkhul et al., "Many situations and tasks in enterprises require a clear understanding of the established organizational structures and existing processes, which can be achieved by creating enterprise models to visualize these structures and processes. Such a visualization describes the current situation in the enterprise and helps to clarify relations and dependencies between various parts of the organizational design." [1].

The goal is to provide deeper insights into the relationship between the concept behind Sentimate, the software, and its stakeholders. Indeed, the model has more than one benefit: first, to clarify the different responsibilities of the actors. Second, to outline the objectives that companies aim to achieve by implementing our software. Then, the model highlights the process, underlining the steps from the beginning to the final plan actions of the HR departments.

2 The Model

The aim of this section is to describe and analyze the enterprise model designed for this case. In particular, it outlines the design decisions and it provides the description of the models created using two different modeling languages - **4EM** and **ArchiMate** - each with three aspects called perspectives in 4EM and layers in ArchiMate. Additionally, the tools employed and so why the choice to use one model rather than the other in Subsection 2.4, how the model is applied in practice in Subsection 2.5, and the evaluation of the model in Subsection 2.6.

2.1 Design of the Model

The design of the model is attempted to be on a simple and understandable level. This means, both the company and its employees should understand the model and benefits from using it.

One of the most important features of enterprise models used for visualization purposes is that they have to be easy to understand for the targeted users. For this reason, the model is given in a **top-down approach** [1], i.e., the goal aspect is given first, then the roles or actors, and finally processes. The logic behind this choice is because it is presented the goals of the enterprise at first. Then, to achieve the goals, some certain roles/actors must exist, who moreover do also some tasks (i.e. processes). Designing the model in a top-down manner provides a better understanding for stakeholders. As a result, reported in Table 1, the model incorporates these three aspects of the enterprise in both 4EM and ArchiMate.

4EM Enterprise Perspectives	ArchiMate Layers
Goals	Motivation layer, includes Goals and Requirements
Business Processes	Business layer, includes Business Processes
Actors and Resources	Business layer, includes Actors, Roles and Organizational Units

Table 1: Components of 4EM and ArchiMate

2.2 4EM

Enterprise Modeling can be used for a multitude of different purposes, like visualizing the current situation, analyzing the reasons for shortcomings or problems, optimizing processes [1]. Enterprise Modeling offers practical tools which can be adapted to the situation at hand and to the purpose in focus. In general, the 4EM method uses six interrelated sub-models (Figure 1) [1].

However, for this case the focus is on three of them: **Goal Model (GM)**; **Actors and Resource Model (ARM)**; **Business Process Model (BPM)**.

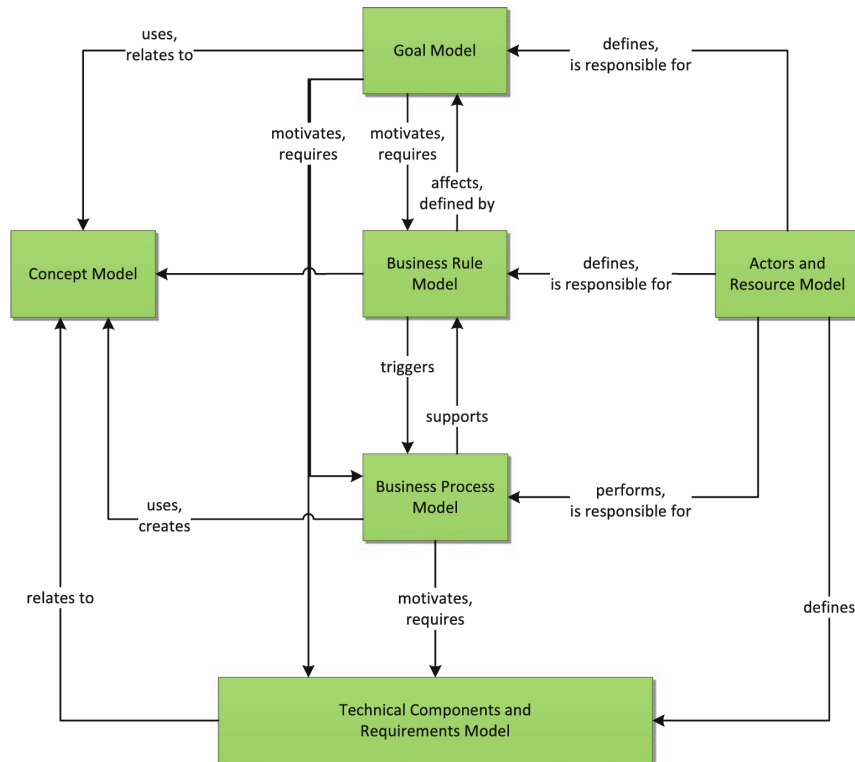


Figure 1: Sub-models of the 4EM approach and their relationships

Goal Model

The Goal Model focuses on describing the goals of the enterprise. In this case, the Company's stakeholders want to build and create a workplace well-being, seeking to implement a holistic synergy wellness model in their organization (Figure 2). So, from this main goal (Goal 1), there are two other goals (Goal 2 and Goal 3) which are related to it using AND-connector, because both are necessary to achieve Goal 1. Then, Goals 2 and 3 are further divided into sub-goals, which lead to opportunities for increasing productivity (Opportunity 1). Obviously, to achieve these goals, some certain actors and resources must exist, as reported in Figure 3.

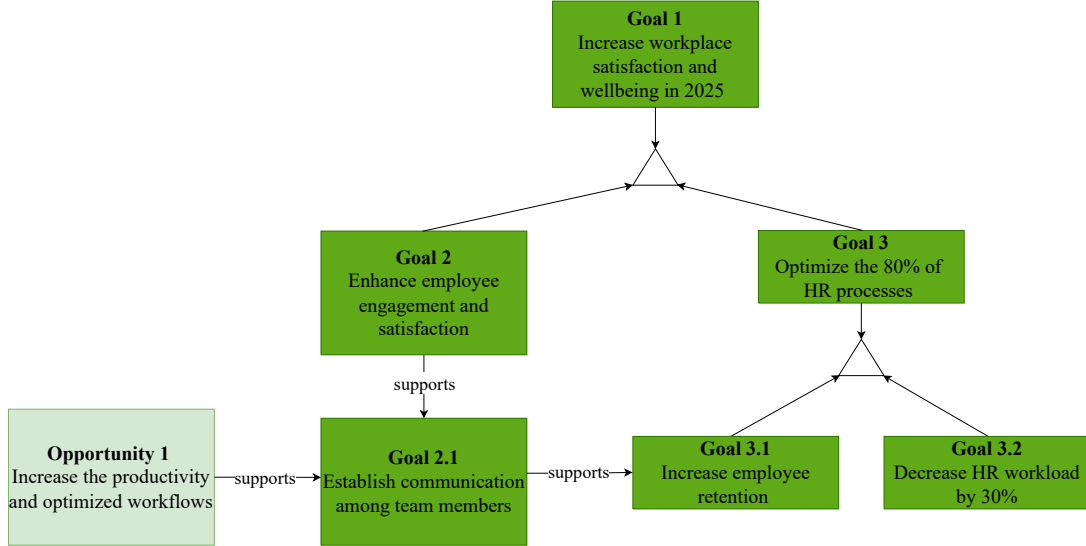


Figure 2: 4EM - Goal Model

Actors and Resource Model

The Actors and Resource Model is used to describe how different actors and resource are related to each other and how they are related to the GM, and to components of the BPM - as reported in the Subsection 2.2.

ARM usually clarifies questions such as who is/should be responsible for performing specific processes and tasks, and how the reporting and responsibility structures between actors are defined. As reported in Figure 3, there are three roles in a general company before implementing the Sentimate's software:

- **Role 1:** the company's CEO, in collaboration with its stakeholders, aims to create a better work environment;
- **Role 2:** the HR Stakeholder Department who works with CEO and interacts with the employees. The HR department define the action plan to follow and analyze the results of the surveys manually;
- **Role 3:** the employees who work within the company's stakeholder group. Employees fill the HR's surveys in a manual manner, without the use of digital tools. Much of the work is, in fact, completed manually with "*paper and pen*" (Resource 1).

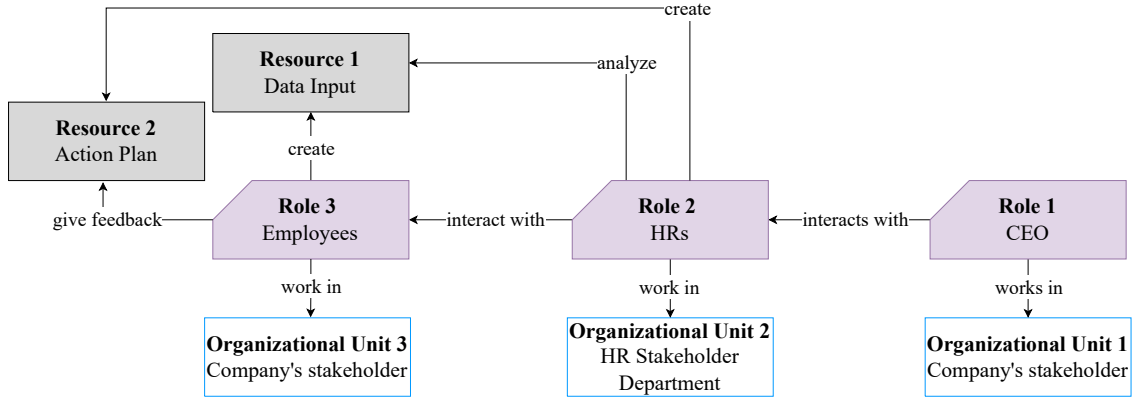


Figure 3: 4EM - Actors and Resource Model

Business Process Model

Goal Model and Actors and Resource Model described in the previous sections motivate particular processes in the BPM: the processes are needed to achieve the goals stated [1]. Indeed, BPM usually clarifies how the business processes and tasks should be performed. As reported in Figure 4, it starts with Process 1 where data is collected through surveys, diaries, and open questions made by the HR department. The data input happens thanks to the employees who fill the surveys. Finally, Process 3 involves receiving insights, analyzing critical areas, developing action plans, implementing them, and monitoring progress in a manual manner - the entire process is the responsibility of the HR Department. The BPM not only defines the tasks, but also ensures that the defined goals are addressed and it provides the structured approach to achieve these goals efficiently.

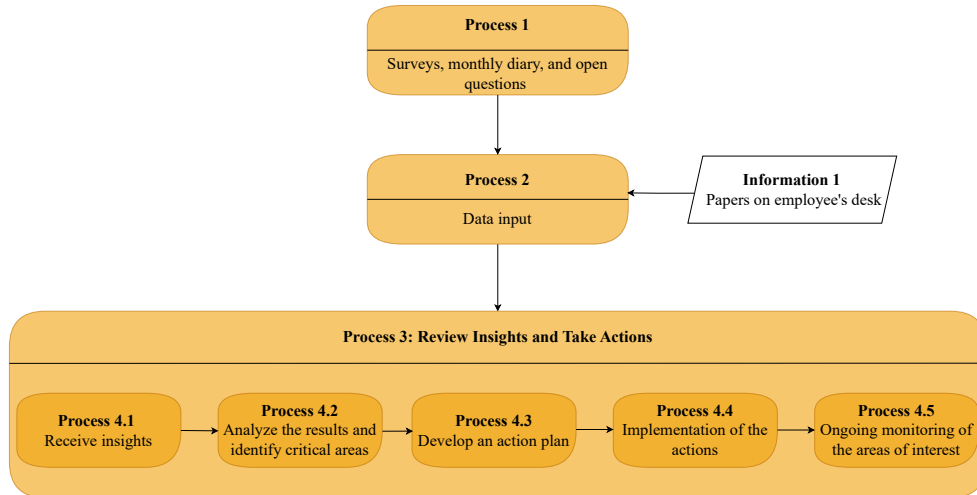


Figure 4: 4EM - Business Process Model

By *surveys*, *reports*, *daily diary*, or *open questions*, we refer to anonymous surveys that are manually created and analyzed after being completed by employees, to monitor how the employees feel in the company.

To conclude, Figure 5 outlines the entire 4EM model and the relationships previously described between the three perspectives, **before** the implementation of Sentimate's software in a Company.

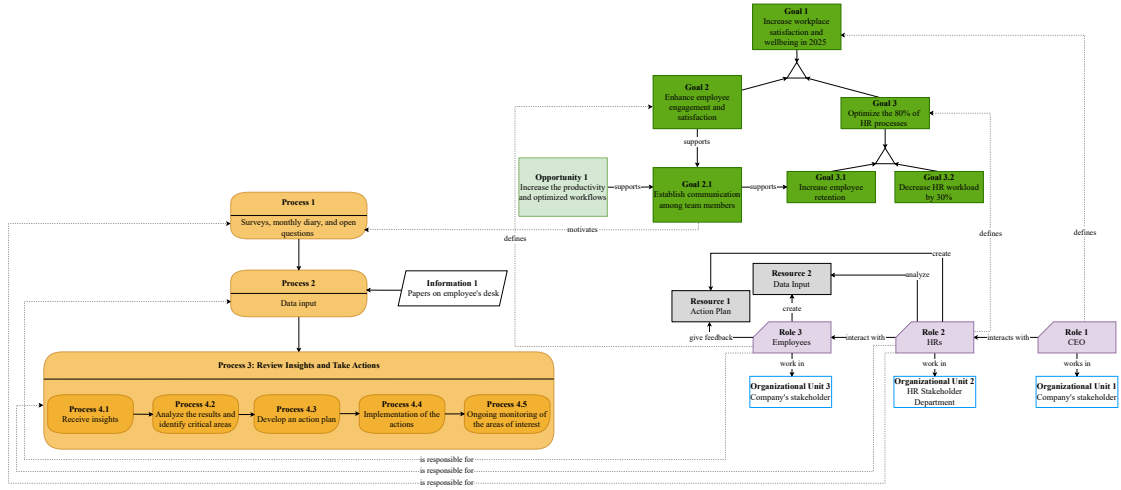


Figure 5: 4EM - Enterprise View

2.3 ArchiMate

ArchiMate provides instruments to support enterprise architects in describing, analyzing, and visualizing the relationships among domains in an unambiguous way. It also offers a common language for describing the construction and operation of business processes, organizational structures, information flows, IT systems, and technical infrastructure. This insight helps stakeholders to design, assess, and communicate the consequences of decisions and changes within and between these business domains and it uses the concept called layers [2].

As a result, models created for the different layers can be aligned with each other. Similar to 4EM, in this section, the three different layers are presented and they are combined together to show the entire enterprise view: Motivation Layer, includes **Goals and Requirements**; Business Layer, includes **Actors and Roles**; Business Layer, includes **Business Processes**.

Goals and Requirements

The model is based on a value which represents the relative worth, utility, or importance of a concept. In this case, the importance to create a synergy wellness model. This value has a strong relationship with the Goals and Requirements layer and the Actors and Roles layer. Indeed, as reported in Figure 6, from the value there are two possible outcomes which represents an effect linked to the main goal which represents a high-level statement of intent for the organization and its stakeholders, so achieve a workplace well-being. Different drivers motivate the enterprise both to define and to achieve the goal.

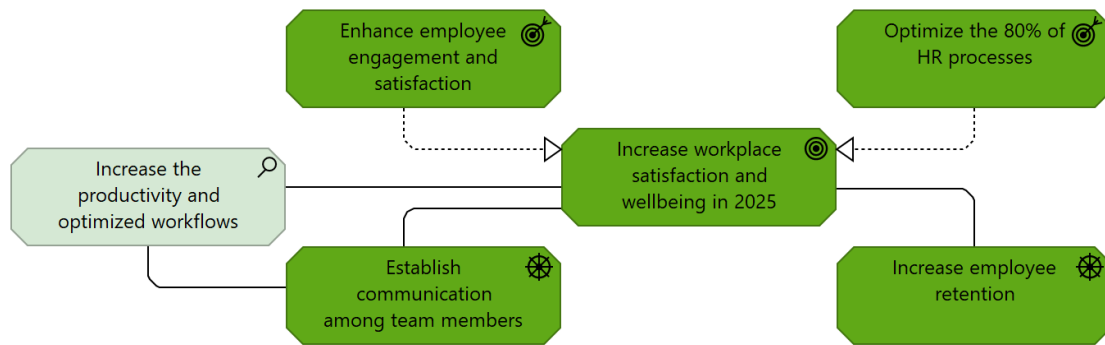


Figure 6: ArchiMate - Goals and Requirements

Actors and Roles

To achieve the goal, as in 4EM, it is necessary to consider the Business Actors which represent a business entity that is capable of performing behavior. The main one is the CEO who wants to implement and create a synergy wellness model. As illustrated in Figure 7, the structure is the same as in 4EM (Figure 3).

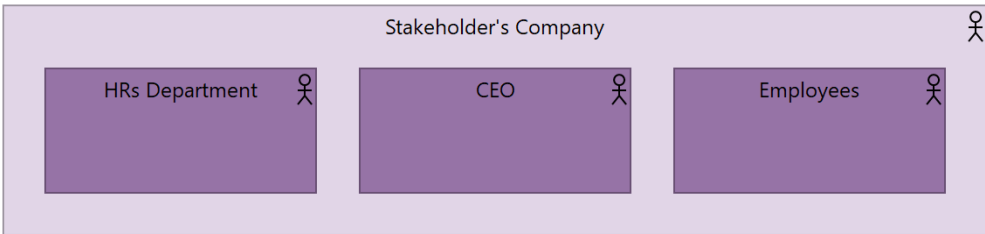


Figure 7: ArchiMate - Actors and Roles

Business Processes

Goals and Actors are linked to the Business Process which represents a sequence of business behaviors that achieves a specific result such as a defined set of products or business services. As reported in Figure 8, this is the process from the creation of the surveys to the implementation of the action plan.

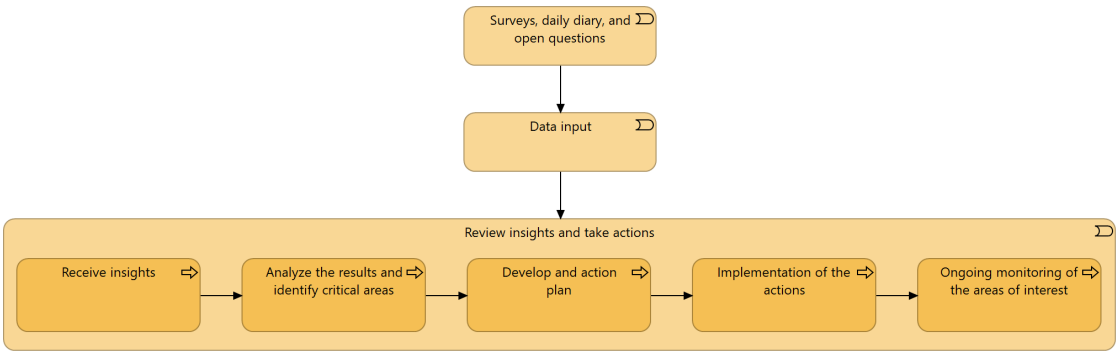


Figure 8: ArchiMate - Business Processes

To conclude, Figure 9 outlines the entire ArchiMate model and the relationships previously described between the three layers.

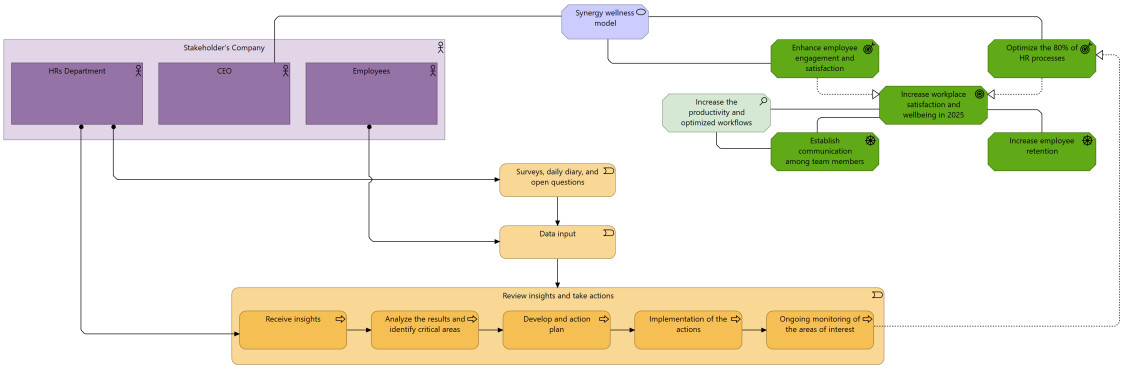


Figure 9: ArchiMate - Enterprise View

2.4 Modeling tools

4EM has been chosen as the model to proceed with. After modeling the three aspects in both 4EM and ArchiMate, it is clear that both languages are suitable for this case. However, there are some differences that led to the **selection of 4EM**. For modeling 4EM, I used draw.io which is a very simple and user-friendly tool. Moreover, I was already familiar with it due to previous university experience using it for modeling in entity-language languages, UML, and SQL. Compared to ArchiMate, I felt more comfortable with the tool and its functionalities. Experience shows also another advantage that it is easy to switch from 4EM to another method, since most concepts and perspectives used in 4EM are also available in other EM methods [1].

In my opinion, 4EM provides a **more intuitive flow** of the all enterprise and appears to be **more organized** compared to ArchiMate. However, one advantage of ArchiMate is that it offers more features than 4EM in the Actors and Roles and Business Processes aspects. As I wrote above, both languages suit this case well, but the chosen model is 4EM due to the ease of use and my previous with the tool. Moreover, it offers a practical and flexible set of work procedures, tools, and practices, which can be adapted to the situation at hand and to the purpose in focus [1]. To conclude, this is not the case, but 4EM allows many participants to be involved and be able to contribute to the model at the same time, so that there are different points of view even if people are in different places [1].

2.5 Using the model

The **primary stakeholder** of this initial pre-innovation phase model is the **Company itself**. The overview of the model can be represented as a high-level diagram that visualizes the general view of a Company **without the implementation of Sentimate**, as reported in Figure 10:

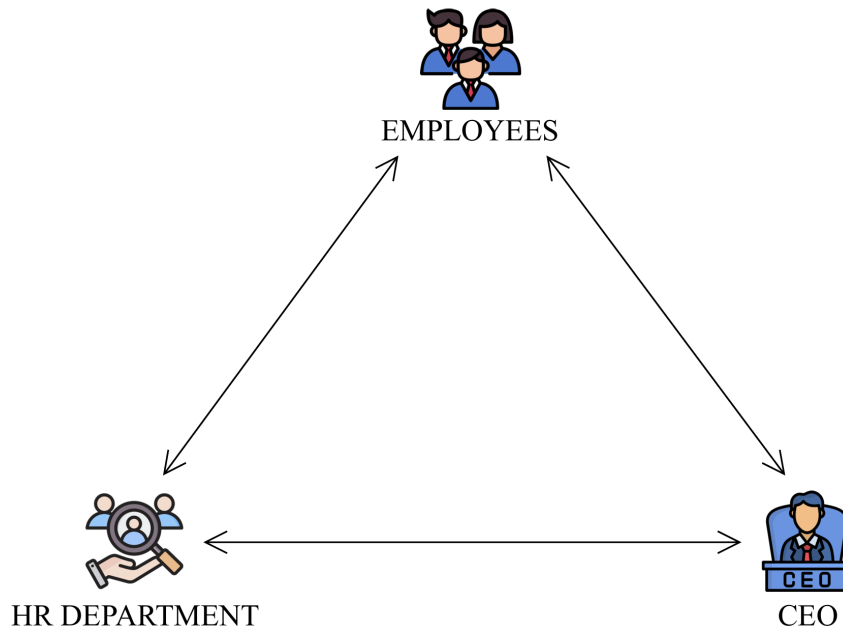


Figure 10: Overview of the Model Pre-Innovation Phase

The goal of the model, as wrote in the previous Subsections, is to understand organizational dependencies of Sentimate related to a possible Company which wants to create a synergistic wellness model, as detailed in the Section 5. A possible general overview of the situation **with the implementation of the Sentimate AI software** is reported in Figure 11.

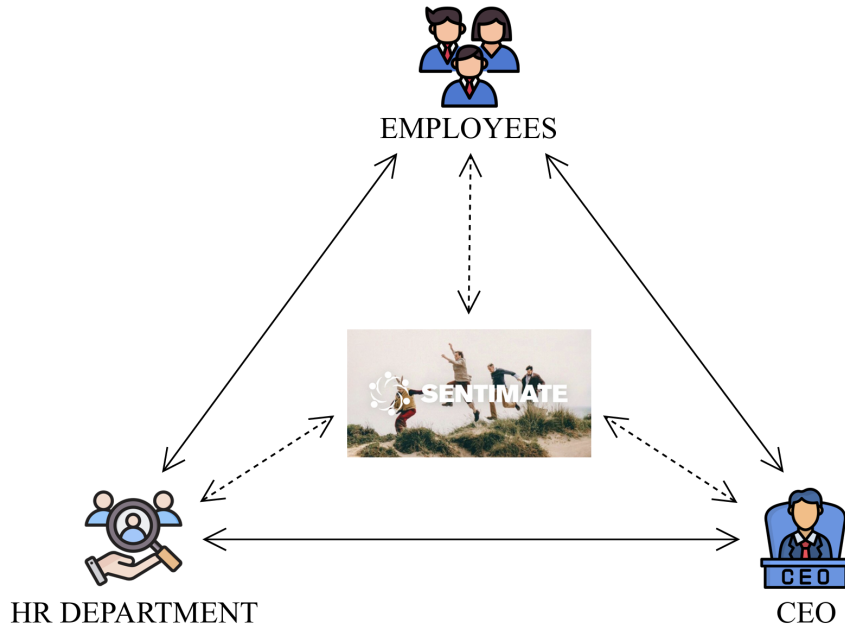


Figure 11: Overview of the Model Post-Innovation Phase

2.6 Evaluating the model

To evaluate the model in its initial pre-innovation phase, the **Semiotic Quality Framework (SEQUAL)** and the **Competency Questions (CQs)** are employed.

SEQUAL Framework

SEQUAL is a framework based on semiotics for understanding the quality of conceptual models and modelling languages. It evaluates models in terms of their ability to meet stakeholder needs and align with the organizational goals they represent. The main concepts and their relationships are shown in Figure 12 [3].

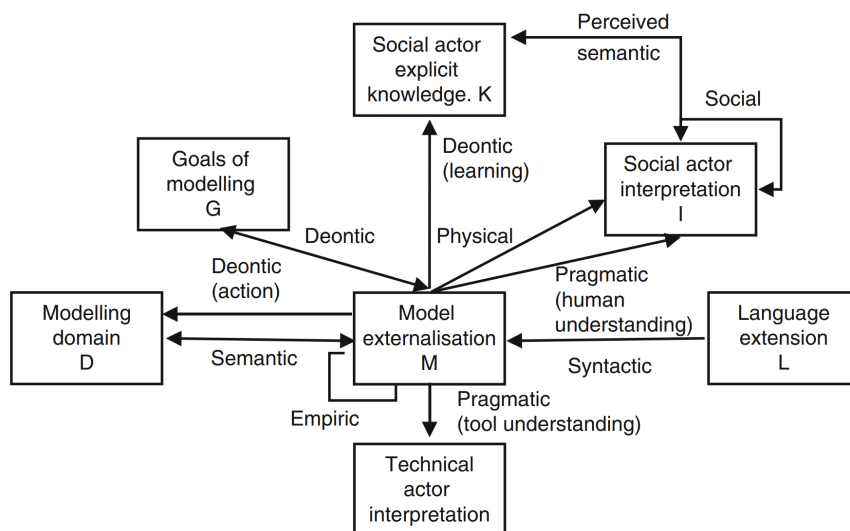


Figure 12: SEQUAL Framework for discussing quality of models

The framework measures the quality of a model from seven perspectives:

1. **Physical Quality:** the model is stored both locally on the computer, and in the cloud (Google Drive). This ensures that the model is always accessible even if accidents happen. Furthermore, the model can be exported to PNG or PDF formats, making it easy to share with interested parties;
2. **Empirical Quality:** the model is clear and visually well structured, ensuring readability and accessibility. The different use of colors for goals, processes, roles, and organizational units makes it easy to follow relationships [4]. Moreover, labels names such as *Process 1*, *Goal 3.1*, and *Resource 1* are clear. Furthermore, the model provides a realistic representation of the enterprise’s communication processes between employees and HR. For example, *Process 1: Surveys, daily diary, and open questions* reflects methods commonly used to gather employee insights;
3. **Syntactic Quality:** the model follows the 4EM notational conventions correctly, maintaining consistency in how roles, processes, goals, and resources are represented. All elements are linked in the correct way, as defined by Sandkuhl et al. [1];
4. **Semantic Quality:** the model aligns well with the domain it represents, meeting the relationships between roles (e.g. employees and HR), processes (e.g. reviewing insights and take actions), and goals (e.g. enhancing employee well-being and optimizing HR processes). Each goal is also supported by sub-goals and processes, such as *Goal 2.1: Improve team dynamics*, which is supported by *Process 3: Review insights and take actions*. However, the optimization of HR processes is not well defined: for instance, the process is almost done with “*paper and pen*”, which means that for large companies it takes a lot of time. This highlights the need for a better improvement;
5. **Pragmatic Quality:** the model is intuitive and easily understandable by stakeholders such as HR staff and employees. As already reported in Subsection 2.1, the hierarchical structure of the top-down approach provides a better understanding for stakeholders (Figure 5);
6. **Social Quality:** the model addresses the perspectives of key stakeholders, such as HR, employees, and the company’s CEO. It provides a framework for collaboration, especially by defining roles and processes that encourage interaction between stakeholders;
7. **Deontic Quality:** the model reflects the rules of the organization, such as the responsibility of HR to act on employee feedback or the CEO’s role in overseeing processes. However, goals like *Goal 3.2: Reduce the work of HRs* implicitly suggest improvements for this process.

The model demonstrates a good quality across the SEQUAL dimensions, aligning its structure and content with the organizational goals and stakeholder needs. However, to achieve all the goals is necessary to define a better structure of the process.

CQs

To assess whether the model meets its purpose, Competency Questions (CQs) are employed to evaluate its ability to answer a range of questions [5]. This provides an indication of the model’s competence or how well it supports workplace well-being and HR optimization. For example:

- **CQ1:** How does the feedback collected from employees contribute to the development of actionable well-being initiatives?
- **CQ2:** What are the specific steps HR must take to reduce workload by 30%, and how are these steps supported by the model?
- **CQ3:** What are the specific steps the Company needs to take to optimize the 80% of HR processes?
- **CQ4:** How can the implementation of Sentimate ensure improved communication between employees and HR?

CQs can help identify areas where a model needs to be improved. For instance, if a model is unable to answer a question about how goals are affected by the lack of a particular competency, then the model may need to be improved to include information on how competencies influence goals [5]. Not all the CQs have a clear answer: *CQ2* and *CQ3* cannot be adequately answered because it is unclear how the Company wants to achieve these goals and through which specific processes. In fact, the HR department typically operates in a fully manual manner, without the use of digital tools. Much of the work is completed manually with "*paper and pen*". It is impossible to imagine that by creating surveys, reports, daily diary, and open questions, the HR department would be able to process all that data manually. So, to achieve all the goals is necessary to define a better structure of the process.

For the evaluation of the model post-innovation phase, please refer to Section 5.

3 Open Service Innovation and Service Design

The aim of this section is to describe the service idea and how this could innovate the enterprise, using some digital technology in a sustainable manner. Furthermore, the **Customer Journeys** and **Blueprints** are outlined.

3.1 Type of Innovation

For Sentimate, based on the four main forms of innovation outlined by Rosemann [6], the chosen approach is service innovation, focusing on value added services. In this case, the driver of innovation is related to a **problem-driven innovation**. Nowadays, many companies face challenges related to their HR departments. For instance, lack of clear vision from top management, insufficient data for HR initiatives, and inefficient tools and processes. These problems are reflected on the employees' daily-life: engagement and retention issues, age gap of the team members, and limited interaction with HR. According to Ciriello's definition, "digital innovation means innovating products, processes or business models using digital technology platforms as a means or end within and across organizations." [7]. Sentimate employs AI-driven software to analyze employee feedback and provides a tool to the HR department, making the process faster, more efficient, and scalable.

At the same time, this idea of service innovation aligns also with **sustainability principles** in terms of:¹

- **Economic:** it reduces HR costs by automating the wellness management process;
- **Environmental:** it minimizes resource use through efficient cloud computing;
- **Social:** it promotes employee well-being, to create a productive workforce.

Considering that Sentimate is a startup in its launch phase, it is itself an innovative service and the plan is to basically become a subscription-based SaaS business model, where companies - which are interested in creating a better work environment - pay to use Sentimate's platform.

3.2 Customer Journeys

Based on the actors/roles of the model in Subsection 2.2, it is necessary to describe the customer journeys from the view of each user/customer which is different based on the specific touch points of each category: in fact, there is a clear difference between the employee's experience and the perspectives of the HR department or CEO. Each role engages with the platform but through different interactions [2]. This subsection provides two different perspectives of the customer journey, before and after innovation. The first perspective comes from employees across the company, while the second from the HR department. The CEO's perspective is not considered, as their role remains essentially the same in both scenarios: review and analyze whether the reports defined by the HR department are appropriate and assess if the company's situation is stable and profitable.

¹More details about how Sentimate relates to the UN Sustainable Development Goals in Subsection 4.2.

Employees

The Figure 13 shows the perspective of the employees. Employees, often do not feel comfortable speaking with the HR Department and they have to fill the surveys manually. Additionally, discussions only take place, for example, once a month, making it difficult to keep track of the company's situation.

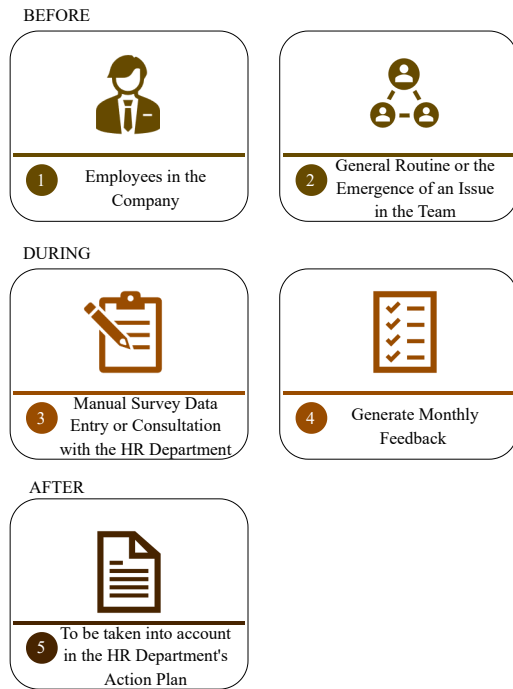


Figure 13: Employee Journey - Pre-Innovation Phase

Figure 14 shows the perspective of the employees after implementation of the Sentimate's software.

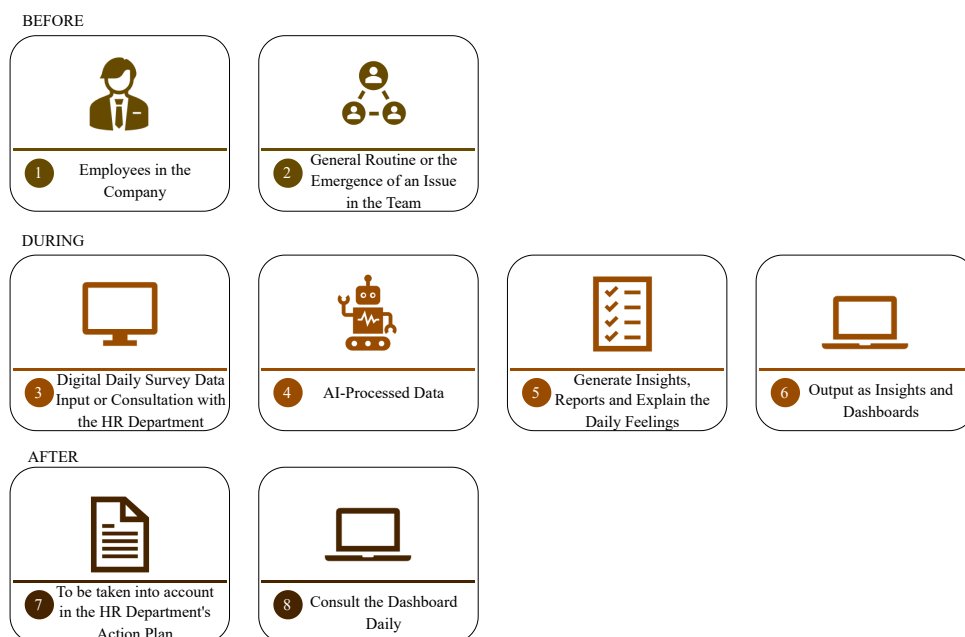


Figure 14: Employee Journey - Post-Innovation Phase

HR Department

Figure 15 illustrates the perspective of the HR department, which typically operates in a fully manual manner, without the use of digital tools. Much of the work is, in fact, completed manually with "*paper and pen*".

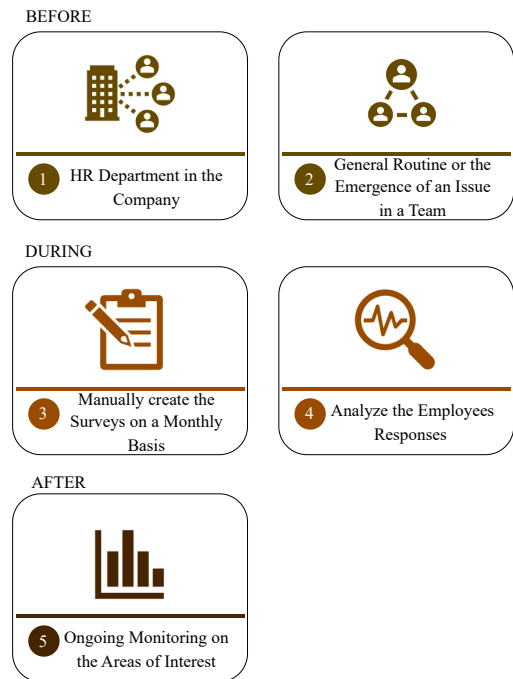


Figure 15: HR Journey - Pre-Innovation Phase

Figure 14 illustrates the HR department's perspective after the innovation, where the workflow is significantly faster thanks to software that processes data more efficiently and generates clearer graphical outputs and dashboards.

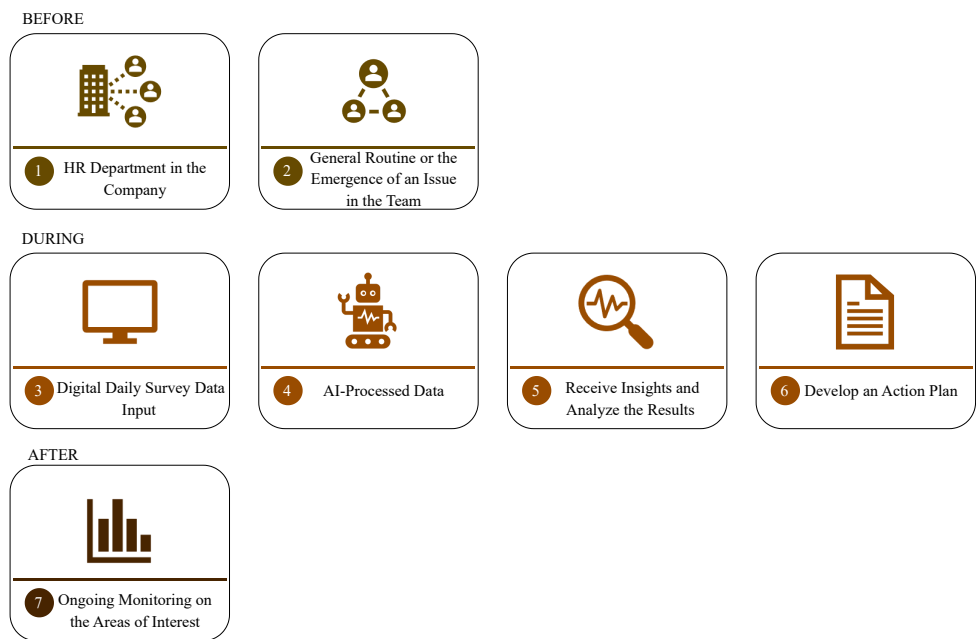


Figure 16: HR Journey - Post-Innovation Phase

3.3 Blueprints

The following section describes the details of realizing the service and where technology is relevant, so how the ICT components are affected and what is the advantages of introducing the digital tools in the enterprise. In fact, the service blueprint integrates with the Enterprise Architecture (EA) model by detailing the interaction between HR-employee and AI processing. This alignment ensures that technology infrastructure supports Sentimate's service, reducing inefficiencies in the current HR workflow and to create a better work environment for the employees. As shown in the Figure 17, tangible touchpoints or digital outputs the customer interacts with (e.g., dashboard, insights, surveys, reports, and summaries) are reported in *online/physical evidence*. Furthermore, between *customer actions* and *front of stage interactions* there is the *line of interaction*, so how employees and HR interact with the Sentimate system directly through surveys and dashboards. Then, *line of visibility*: employees and HR only see the outputs (e.g., insights and dashboards) but not the AI's back-end processes, which is part of the *line of internal interaction*. The Sentimate department coordinates with the IT service to maintain system functionality, so the activities performed by third parties or other departments to enable the service (e.g., IT support, Data Security, Legal Department).

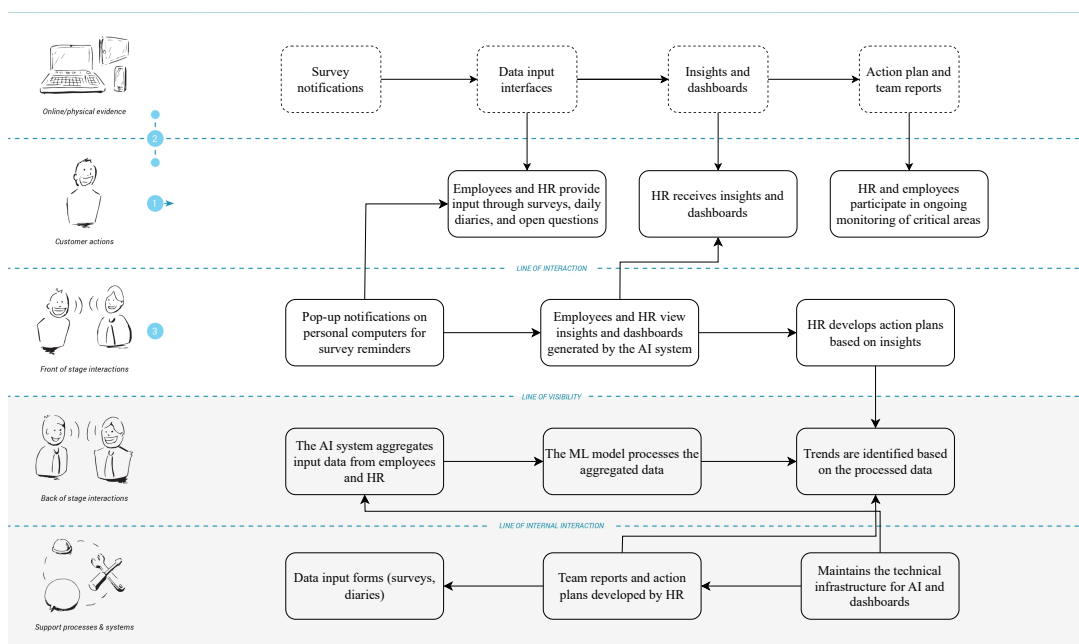


Figure 17: Service Blueprints

3.4 Reflections

In general, the primary purpose of innovation is to deliver value to stakeholders. In this case, it involves an enterprise that chooses to adopt Sentimate’s software. This value is captured in a sustainable business model, which emphasizes how an organization creates, delivers, and captures economic, environmental, and social value, as reported in the Section 4.

Furthermore, customer journeys help to give an overview of all the steps the different actors are involved in. These *touchpoints* help to see multiple aspects, and how they are affected by the innovation. The enterprise model focuses on one view and generalizes interactions, so it is necessary to implement and develop a complementary service which allows to understand the different perspectives from the view of each user/customer which is different based on the specific touch points of each category, as described in Customer Journeys.

To conclude, the service blueprints details customer journey maps in its emphasis of customer touchpoints, but focuses more on the realization of services by underlying activities [2]. Furthermore, service blueprints are more detailed regarding how to manage a service, and the timing of interactions between the customer and the service provider [8]. In this particular case, the service

blueprints tries to be comprehensive and to mapping the end-to-end process from data collection through the employee feedback to the final action plan made by the HR department. The main value proposition of the customer journey is to point-out the main touch point of the organization, as described in Blueprints.

4 Business Modeling & Sustainability

The aim of this section is to outline the Business Model Canvas and how the 17 Sustainable Development Goals (SDGs) are taken into account, ensuring a sustainable business innovation.

4.1 Business Modeling

Nowadays, it is important to consider the triple layered Business Model Canvas (Figure 18): a sustainable business model as the rationale of how an organization creates, delivers, and captures economic, environmental, and social forms of values [9]. In the following Figure 19, the Flourishing Business Model of Sentimate is reported:

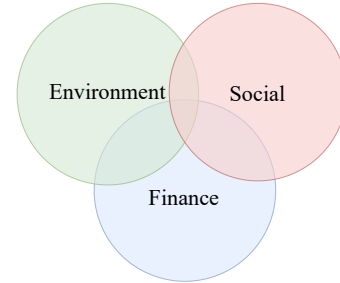


Figure 18: Triple Layered Business Model Canvas

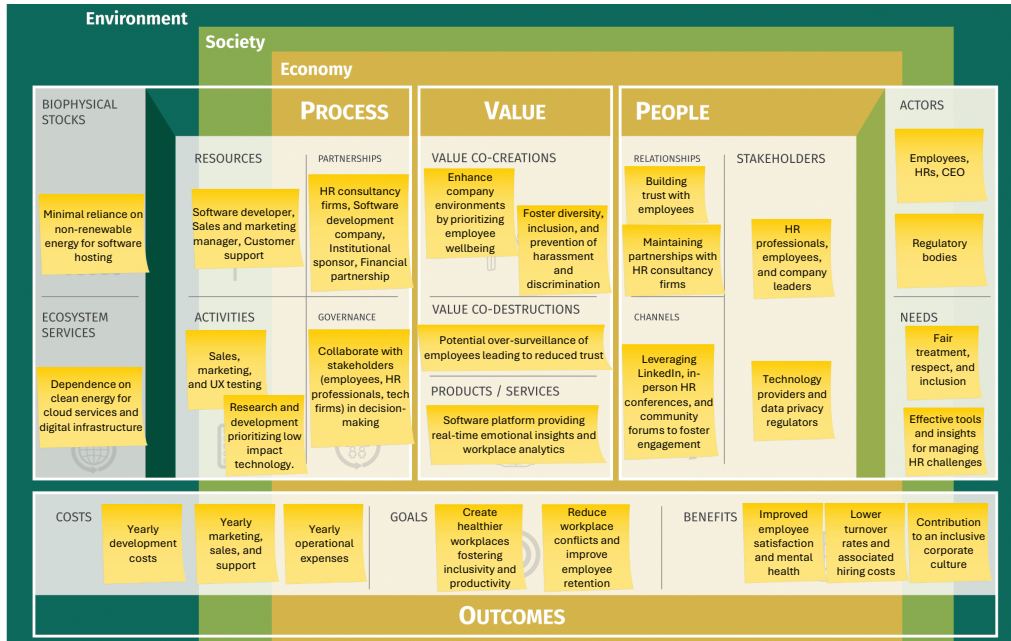


Figure 19: Flourishing Business Model

According to Osterwalder and Pigneur, a business model describes the rationale of how an organization creates, delivers, and captures values [10]. This framework allows for a structured, flexible way to understand the core elements of the business and how they are related. It is essential in the launch phase of the startup, where it is necessary to understand who the customers are and what value is provided to them. This template has been chosen because it allows for a deeper exploration of how the company creates value not only for the economy, but also for society and the environment. The Flourishing Business Canvas is based on the relationship of systems, relationships with stakeholders, and the ecosystem in which the company operates. Furthermore, it is more complete as it asks 16 questions (including the 9 questions from the Business Model Canvas) to address the 3 dimensions: in fact, it is important to ask questions that reflect the 3 dimensions of sustainability when a sustainable business model is created.

In particular, the business model canvas outlines important elements such as the **value pro-**

position: enhancing the company work environment focusing on the well-being of the employees and support HR departments in managing this aspect. At the same time, also foster diversity, inclusion, and prevention of harassment and discrimination. To conclude, the goal is to enhance the productivity through effective Top-Down communication, which is not a very common thing in today's companies as it is as if the employees are afraid of the HR department.

4.2 Sustainability

Nowadays, integrating sustainability into Sentimate's business model can provide significant benefits, as explored in the literature by Purvis [11], who emphasizes the need for businesses to create value in a way that benefits are not just for the company but also for the society and the environment. However, *sustainability* remains an open concept with myriad interpretations and context-specific understanding.

Sustainability in business refers to the creation of long-term value by considering how a given organization operates in environments. Given the Sentimate's value proposition, a particular focus will be given to the **social dimension of sustainability**. Indeed, Sentimate's commitment to social sustainability is evident in its efforts to ensure fair labor practices and promote diversity and inclusion within its workforce. It is recognized that a sustainable business must also contribute to the well-being of employees [12]. This social dimension of sustainability is critical for fostering long-term relationships with stakeholders and enhancing the company's reputation. Sustainability involves adopting practices that meet present needs without compromising the ability of future generations to meet their own needs. This focus not only improves individual health and happiness but also drives organizational productivity and stability (**Goal 3 and 5: good health and gender equality**)*. Recent research underscores that integrating Sustainable Human Resource Management (S-HRM) practices can significantly enhance both organizational performance and employee well-being. One important part of S-HRM is focusing on employees' happiness and fulfillment. This means making sure employees feel engaged and satisfied in their work. Research indicates that sustainable HR practices, like offering customized deals for each employee, can boost creativity and overall well-being over time. By doing this, companies can create a supportive atmosphere that encourages employees to take initiative and grow personally, which is key for keeping both employees happy and fostering innovation in the organization (**Goal 8: more engaged work environment**)* [13]. In line with this, a social business model will emerge thanks to the implementation of an AI software data driven (**Goal 9: tech aspect of Sentimate**)*. This corresponds to the social dimensions of sustainable business models discussed by Sinkovics [14].

Considering the above concept of sustainability in Sentimate and the [17 Sustainable Development Goals \(SDGs\)](#), the following pillars are taken into account (Figure 20):



Figure 20: Key Pillars reflected in Sentimate

*17 Sustainable Development Goals (SDGs)

5 Redesigned Enterprise Model

This section presents the changes in a general Company after the implementation of Sentimate's software. The aim is to redesign the model in 4EM to understand how Sentimate would support the organization.

5.1 Goal Model

The Goal Model focuses on describing the goals of the enterprise. In this scenario, the Company's stakeholders aim to establish an AI-driven workplace well-being model by 2025. This represents a significant transformation in the EA, where artificial intelligence plays a central role in implementing a holistic synergy-based wellness model (Figure 21). Sentimate offers the software to create it. Additionally, changes are reflected in *Goal 3* and *Goal 3.2*: initially, the Company lacked the appropriate tools to optimize HR processes and reduce the workload of the HR department.

Obviously, to achieve these goals, some certain actors and resources must exist, as reported in Figure 22.

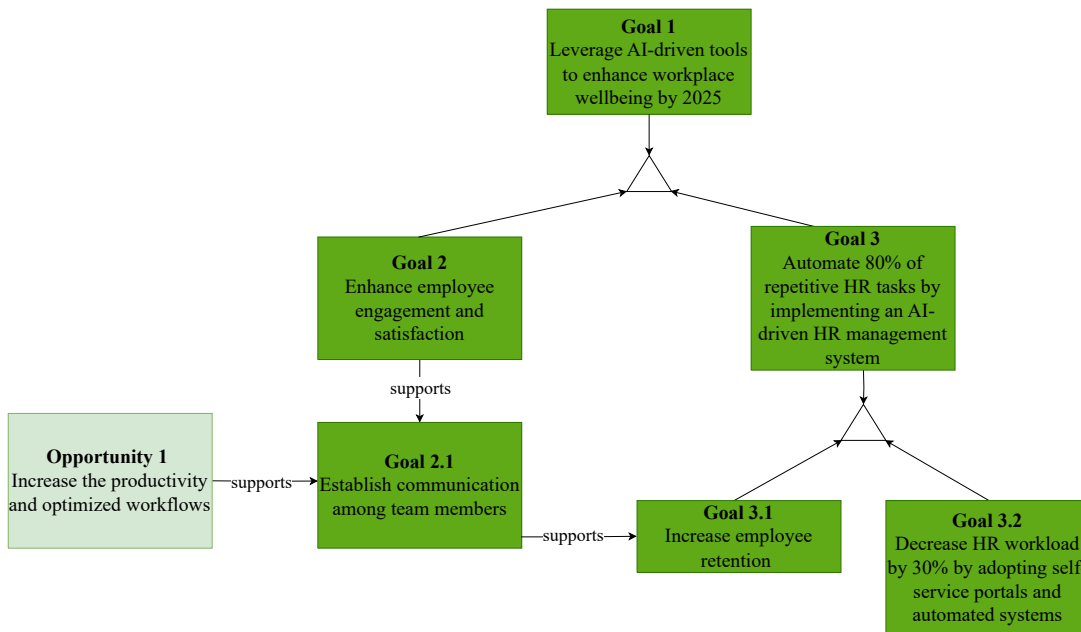


Figure 21: 4EM - Final Goal Model

5.2 Actors and Resource Model

The structure of ARM remains similar to the pre-innovation phase. However, the addition of Sentimate's role is significant, as it incorporates AI software. In Figure 22, the final AR model is reported, where there are four roles:

- **Role 1:** the company's CEO, in collaboration with its stakeholders, aims to create a better work environment AI-driven;
- **Role 2:** the HR Stakeholder Department who works with both CEO and the IT service of Sentimate which provides the software, so the data and the insights (Resources) with which HR define the action plan to follow;
- **Role 3:** Sentimate's IT service interacts with the HR department and manages all aspects related to the platform and the software;
- **Role 4:** the employees who work within the company's stakeholder group.

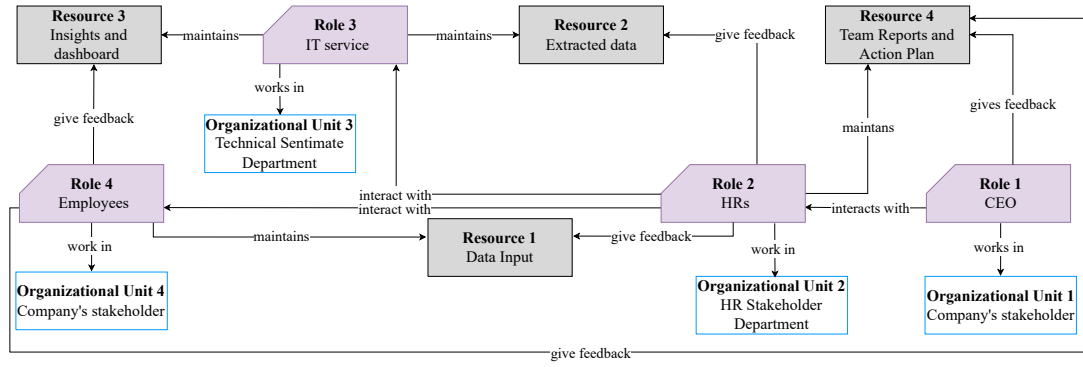


Figure 22: 4EM - Final Actors and Resource Model

5.3 Business Process Model

Goal Model and Actors and Resource Model described in the previous sections motivate particular processes in the BPM: in fact, there is the implementation of a new process. As reported in Figure 23, it starts with Process 1 where data is collected through surveys, diaries, and open questions made daily by the HR department. The data input happens thanks to the employees who fill the surveys. Process 3 involves the use of the AI software which aggregates the input data, processes it with a machine learning model, and generates insights and dashboards as output. Finally, Process 4 involves receiving insights, analyzing critical areas, developing action plans, implementing them, and monitoring progress thanks to heat map, charts, and graphics. The HR department's workflow is significantly faster thanks to software that processes data more efficiently and generates clearer graphical outputs and dashboards.

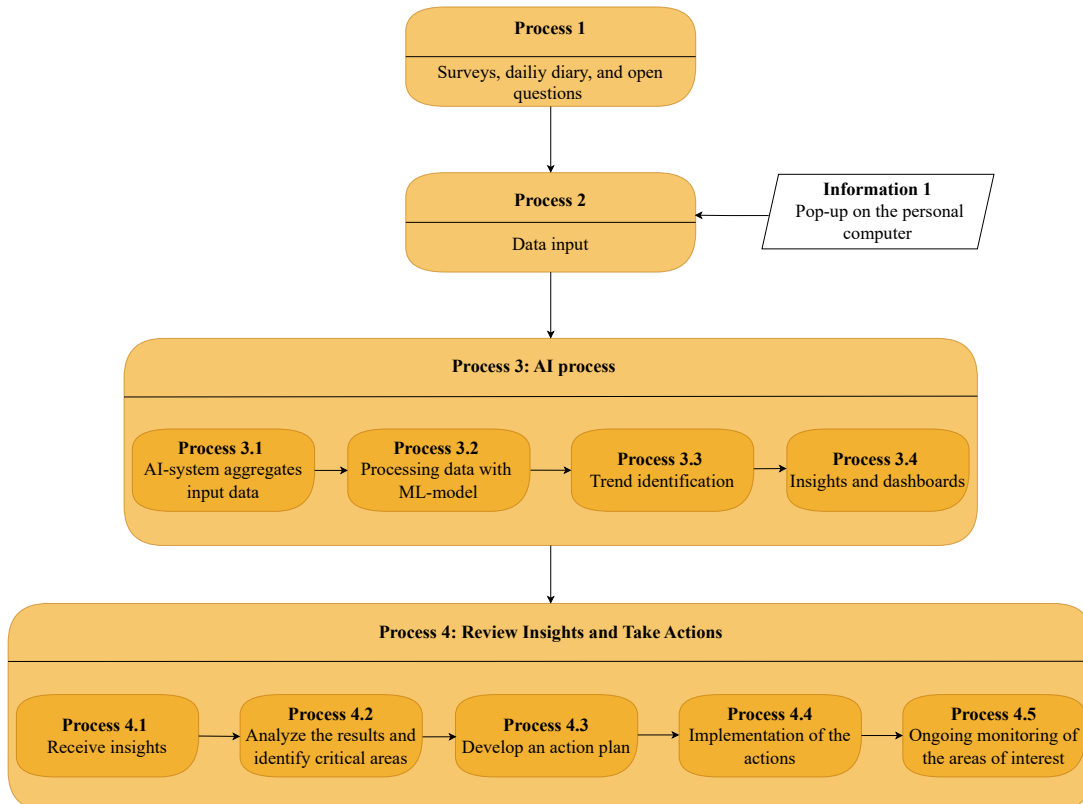


Figure 23: 4EM - Final Business Process Model

To conclude, Figure 24 outlines the entire 4EM model and the relationships previously described between the three perspectives, after the innovation phase with the implementation of Sentimate's software.

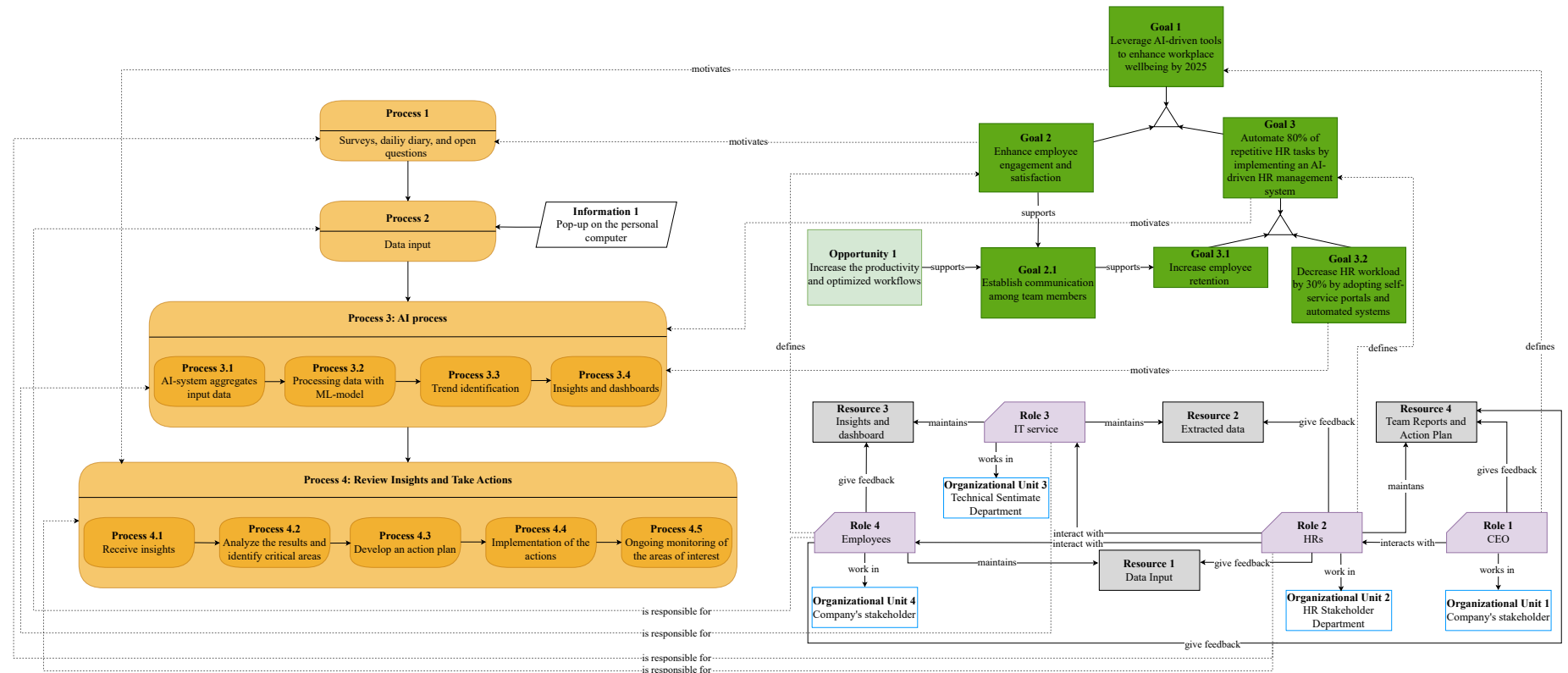


Figure 24: 4EM - Final Model

5.4 Evaluating the model

To evaluate the model in its post-innovation phase, the **SEQUAL Framework** and the **CQs** are used, as in the pre-innovation phase.

SEQUAL Framework

Changes in the evaluation using SEQUAL Framework are done in only two of the seven perspectives:

- **Semantic Quality:** the model aligns well with the domain it represents, meeting the relationships between roles (e.g., employees and HR), processes (e.g., reviewing insights and take actions), and goals (e.g., enhancing employee well-being and optimizing HR processes). Each goal is also supported by sub-goals and processes, such as *Goal 2* is now supported by *Process 1*; *Goal 3* and *Goal 3.2* are now supported by *Process 3*. So, the optimization of HR processes is well defined: for instance, the process is done with the AI software, which means making the process faster, more efficient, and scalable. In the pre-innovation phase, this was not possible due to lack of the appropriate tools;
- **Deontic Quality:** the model reflects the rules of the organization, such as the responsibility of HR to act on employee feedback or the CEO's role in overseeing processes.

CQs

As described for the SEQUAL Framework, after the innovation phase, also the answers to the *CQ2* and *CQ3* are clear and well defined thanks to the implementation of AI software which processes data more efficiently and generates clearer graphical outputs and dashboards.

The model now demonstrates **high quality** across all the SEQUAL dimensions and CQs, and it is understandable how to achieve all the defined goals. There is an improvement for achieving all the given goals.

6 Reflections

The modelling experience was very useful. First of all, now I have a clearer view of what the organizational dependencies are and what is the relationship between Sentimate and the potential stakeholder who buys our software solution. Secondly, from this process, I learnt it is important modelling to understand how the future will be, to organize situations and changes in the organization when something does not work. The most important thing is to understand the purpose of the model. In fact, the model must help us and to fit in perfect way the goal. This process helped me because I had not done anything like it before.

The most challenging aspect of this experience was representing abstract elements into concrete elements within the model. It was often difficult to decide how to represent certain relationships or dependencies without creating a complicated structure. Additionally, understanding and applying theoretical concepts like SEQUAL Framework and Blueprints which required a significant effort to ensure that the model met the requirements.

In general, working in group during all the semester really helped me because I had the opportunity to have different point of view from different perspectives, in a certain way think “outside the box”. In fact, I experienced several revelations and discoveries during the discussions about my case and others. It is easy to get stuck in tunnel vision when working on something for a long time. I found that receiving different perspectives and challenging questions from my peers helped me break out of this tunnel vision.

Next time, I would spend more time in the initial stages sketching ideas on paper rather than jumping into creating a finalized model with the tools. At the beginning of the process, I spent a lot of time building and redesigning the model, thinking it was the final version. However, I realized later that significant changes were needed. By starting with sketches, I could have tested different ideas more efficiently and avoided wasting time. This approach would have allowed me to focus on redefining the core concepts first and then building a more structured final version based on clearer insights.

Overall I am satisfied with the results of my case study, the learning outcomes, and the learning process in this course.

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