ITEA 3

ITEA 3 Call 7

OMD

Optimal Management on Demand

Project Number: ITEA-2021-20003

Project Start Date : 01.01.2022

Project Duration : 36 Months

Scenarios and Use Cases

References :

Work Package : WP2 Use Case Requirement and Business Models

Task : T2.1 Use Cases and Scenario Definition

Deliverable Document : D2.2 Scenarios and Use Cases

Version : V0.2 Jun 15, 2022

Dissemination Level : Public

Authors : in alphabetical order

Company	Name Surname	E-mail
ARD Group	Bilge Başdemir Esin Soycan Özgün Sapmaztürk	bilge.basdemir@ardgrup.com.tr esin.soycan@ardgrup.com.tr ozgun.sapmazturk@ardgrup.com.tr
BEIA Gmbh	George Suciu	george@beia.ro
Caretronic d.o.o.	Simona Brezar	simona@caretronic.com
Dogus Technology	Utku Colak Alper Gun	utku.colak@d-teknoloji.com.tr alper.gun@d-teknoloji.com.tr
Experteam	Taner Ulusinan	taner.ulusinan@experteam.com.tr
FrontEndART Software	Tibor Bakota	tibor.bakota@frontendart.com
FTP - LDA	Germano Pinto	germano.pinto@ftpporto.com isabel.ribeiro@ftpporto.com
ISEP	Goreti Marreiros	mgt@isep.ipp.pt
Strategy Big data	Alberto Oliva	alberto.olivia@strategybigdata.com

Summary

OMD is a software tool that helps service providers from various domains to use their resources effectively, to provide agile solutions, to conserve their knowledge base, to allocate each call unmistakably to the right expert / provider, and with the best solution of the particular problem at hand. This document covers 8 use cases which focus on different sectors.

Table of Contents

1. Introduction

As the main objective of WP2, companies who participate to this study will cover each use case defined in the FPP. Use Cases from various sectors and countries will enable outputs for an efficient OMD framework.

Companies' use cases in this study will cover :

- ARD Group : Justice Sector(EqualityInJustice)
- BEIA GmbH : Logistic and Operations Support
- Dogus Technology : Consumer Electronics (SmartFix)
- Caretronic d.o.o. : Healthcare
- Experteam : Software Support (Tickota)
- FrontEndART : Software Development (Optimal software maintenance task assignment)
- FTP-Com. Equip. Inf. Lda : E-Commerce (Recommend4You)
- Strategy Big Data : Telemarketing (Omniticket)

2. Scenarios and Use Cases

Each Scenario and Use Case prepared by each company listed in alphabetical order below :

2.1. ARD Group

2.1.1. The Problem Statement

Democracy depends on a level playing field in the justice system, but justice can be elusive for poor and low-income citizens unable to obtain counsel due to a shortage of affordable lawyers, a complex web of procedural rules working against them, thus creating a "justice gap". In order to minimize the victimization of vulnerable groups in the legal systems, smart technologies could be developed minimizing the risks and biases associated with human factors, to provide fair and transparent legal aid for appointment and selection of lawyers in civil and criminal justice as well as mediation and reconciliation systems.

Problem 1	
The problem of	Delay in reaching a assigned lawyer
Affects	The Victim/Suspect, Justice Personnel
The impact of which is	Increase in the time of detention of the Victim/Suspect and delay overall service processes of justice personnel
A successful solution would	Create automation in assignment of most suitable lawyer to the court within the trigger of Victim/Suspect's arrival and fasten service processes of justice personnel

Problem 2	
The problem of	Assignment of a lawyer with unsuitable schedule

Affects	Victim/Suspect, The lawyer, Justice Personnel
The impact of which is	Increase in the time of detention, Create dissatisfaction for the lawyer for the means of time management and create repetition scheduling for the Justice Personnel
A successful solution would	Create automation in assignment of most suitable lawyer with proper time management to solve time management problems and increase service quality of Justice Personnel

2.1.2. End-users and Stakeholders Description

2.1.2.1. Stakeholder Summary

Name	Represents	Role
Victim/Suspects	End Users	Participants in Focus groups, usability tests and evaluation pilot studies
Lawyers	End Users	Participants in Focus groups, usability tests and evaluation pilot studies
Justice Personnel	End Users	Participants in Focus groups, usability tests and evaluation pilot studies
Management on Demand Technology Providers	Stakeholders	Participants in focus groups

2.1.2.2. User Summary

Name	Description
Victim/Suspect	People, who are arrested and detained before going to court
Lawyers	Legal professionals who assistVictim/Suspects before, during and after court processes
Justice Personnel	Workers of the legal system, assisting Victim/Suspects and lawyers
Management on Demand Technology Providers	Stakeholders that provide and disseminate technological solutions used by legal authorities

2.1.3. Expected benefits to End Users and innovation expectations

End User Benefit	Supporting Features
Reduced time of arrestment	Automated assignment of lawyers triggered from the arrival of the Victim/Suspect
Optimized Scheduling	Schedule optimization of the lawyers
Reduced Legal Processes	Removal of human interference from assignment processes
Increased Service Quality	Improvements in overall legal system quality of service

2.1.4. Scope and Objectives of Use Case

The Use Case aims to develop and validate a set of information and communication technologies of optimizing appointment/assignment of Lawyers in Justice. In this sense, it intends to innovate essentially in the scope of :

1- Optimizing the assignment of legal aid to people in need
2- Automated tracking and monitoring reducing administrative costs for judicial and law enforcement organizations
3- Enabling new applications for judicial software systems

The objectives set for this use care are :

1- To remove human interference from assignment processes
2- To increase in the process quality from the arrival of the Victim/Suspect till the court verdict

3- To increase the quality of schedule management for lawyers
4- To increase the quality of legal aid

2.1.5. Narrative of Use Case

In a world that is increasingly digitally connected, with day to day increasing avenues for connecting with and interacting with business colleagues, clients, friends, and family, judicial systems which needs to be fair, transparent, and accountable remains relatively closed and obscured. Judicial systems, particularly systems for ensuring fair representation have lagged behind in integrating smart technologies and thus have fallen behind in terms of the digital transition.

The most important goal of our project is to help ensure that the right to legal aid and legal defense, which is one of the fundamental human rights, is used fairly, equally, and transparently for vulnerable communities, low-income litigants, migrants, refugees, and other disadvantaged groups. Our project also aims to tackle the lack of right to counsel in civil cases, which makes it hard for low-income, disadvantaged and vulnerable groups to get fair representation if they have a dispute with a landlord or employer or have domestic violence or deportation case.

Our project aims to introduce smart learning, analytics, ICT, and assistive smart technologies within the scope of legal and judicial systems for levelling the playing field for vulnerable groups bringing fairness and transparency for the legal aid mechanisms used extensively in European countries including grievance and arbitration.

Our use case will employ smart technologies, supported by OMD framework and tools, to reduce victimization of the vulnerable groups in receiving legal aid with smart appointment systems, particularly cases of representation assignments by public/government bodies; assisting with the selection of the ablest, competent and experienced lawyer/representative that is close in terms of location (in an emergency) to the victim or the alleged offender; think of a lawyer who has a good command of the language of the migrants, or a lawyer who has received appropriate training for persons experiencing sexual abuse or violence. Furthermore, the project plans to tackle air and equitable distribution of public funds, ensuring gender equality and further transparency and accountability for these representation assignments.

2.1.6. Use Case Conditions

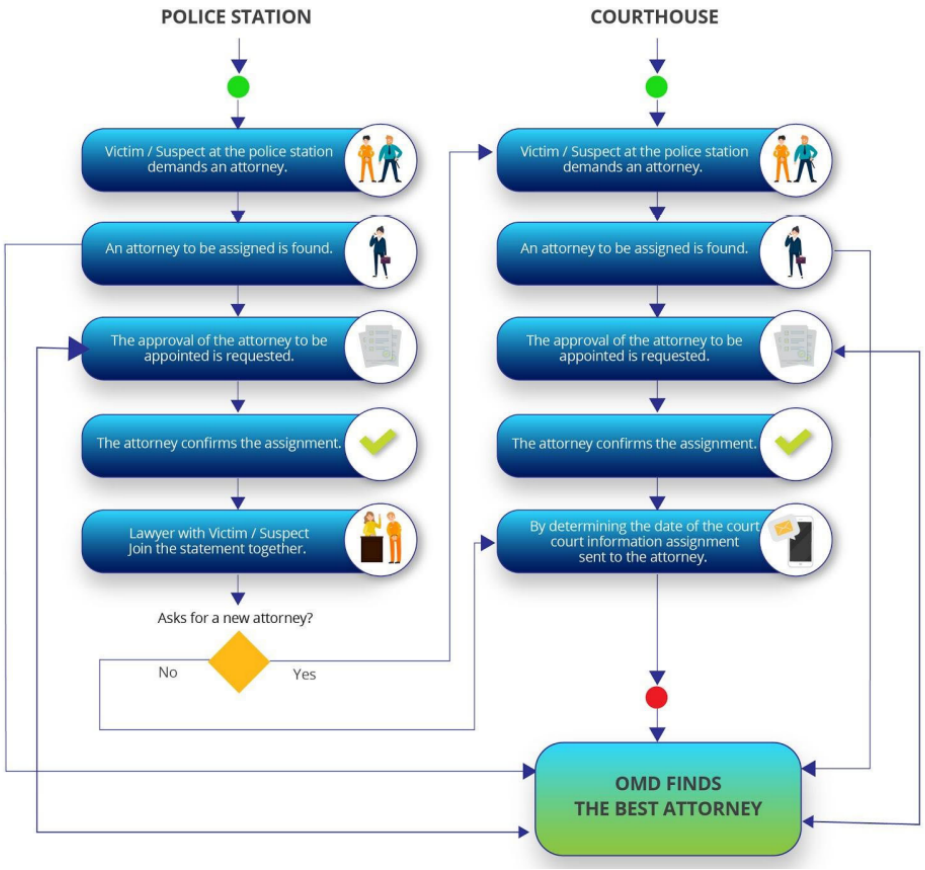
Use Case Condition 1 - Arrival of the Victim/Suspect	
Assumptions	The Victim/Suspect has been brought to the detention area or courthouse
Prerequisites	The Victim/Suspect has an valid identification card/document including his/her citizenship number

Use Case Condition 1 - Willing of the Victim/Suspect	
Assumptions	The Victim/Suspect has been brought to the detention area or courthouse
Prerequisites	The Victim/Suspect has a will to ask legal aid from professionals which will be assigned by the government

2.1.7. Actors

Name	Actor Type	Actor Description
Victim/Suspect	Human	Victim/Suspect and is detained. Will be going to court for legal processes
Lawyers	Human	Is assigned by the OMD EqualityinJustice system to represent the Victim/Suspects in the court
Justice Personnel	Human	Government professionals who take role in the detaining process
OMD EqualityinJustice	System	Automated smart assignment system which optimize the lawyer assignment for the Victim/Suspects

2.1.8. Use Case Diagram



2.1.9. Scenarios

The Turkish Code of Criminal Procedure (Law No. 5271) legally requires Bar Associations, under circumstances stipulated in the law and upon the request of the suspect, to commission counsel for purposes of legal aid.

It is observed that many stages in this process of the suspect to be provided with legal aid, starting with the counsel request of competent authorities to the Bar Associations, evaluation of these requests by the Bar Associations and determination of the suitable attorneys, followed by the issuing of warrants; are laden with a magnitude of problems, mostly using an arbitrary ordering system, only taking into account the number of cases (and with some Bars,

the severity) the lawyer has got in hand without taking language, suitability, education and other factors.

Within the framework of OMD, ARD GROUP will work on identification of improvement points by studying the workflows between the stakeholders i.e. law enforcement, judicial institutions, court and public prosecutor offices, Bar Associations and attorneys; and introduce OMD framework and tools supported by NLP, ML and AI to provide a fair assignment and tracking system for legal aid assignment/appointment.

With OMD, an innovative flexible, parameterized appointment/assignment system, particularly aimed at disadvantaged groups and migrants, that could respond to the various needs of Bar Associations will be developed providing a solution to close the "Justice Gap" by intelligently assigning lawyers according to their abilities, specialities and capabilities, minimizing human error in assignments, accelerating the overall appointment speed and remedying the fair distribution problems encountered in Bar Associations.

Police Station Scenario			
No	**Event**	**Name of Process / Activity**	**Description of Process / Activity**
01	01	Arrival of theVictim/Suspect	Victim/Suspect's arrive to the police stat for identification
02	02	Valid Identification of the Victim/Suspect	Victim/Suspect's ID is checked for 1:1 verification from the AFIS (Automated Biometric Fingerprint System)
03	02	Invalid / No Identification of the Victim/Suspect	Victim/Suspect's ID is checked for 1:N identification from the AFIS (Automated Biometric Fingerprint System)
04	03	Victim/Suspect demands an Attorney	OMD finds the bet attorney
05	04	The approval of attorney	The approval of the attorney is requested
06	04	Attorney Approval	The attorney confirms the assignment
07	04	Attorney Rejection	OMD finds alternative attorney
08	05	Court statement	The attorney and the Victim/Suspect join the statement together

Courthouse Scenario			
No	**Event**	**Name of Process / Activity**	**Description of Process / Activity**
01	01	Arrival of the Victim/Suspect	Victim/Suspect's arrive to the courthouse
02	02	Victim/Suspect demands an Attorney	OMD finds the bet attorney
03	03	The approval of attorney	The approval of the attorney is requested
04	03	Attorney Approval	The attorney confirms the assignment
05	03	Attorney Rejection	OMD finds alternative attorney
06	04	Court statement	The attorney and the Victim/Suspect join the statement together

2.1.10. KPI's

Increasing the success rate of attorney appointments/assignments supported by a satisfaction survey by a minimum of 10%

Decreasing the overall time of appointment/assignments, attorney confirmation and notifications to stakeholders from hours to minutes.

2.2. BEIA GmbH

Beia's use case is combining environmental IoT and data from integrated logistics. OMD platform will provide a novel and smart logistics involving adaptation to new equipment's settlements and different production volumes and type of goods; investment optimization: lower time and cost with installation; plug&play sensors/AGVs system; human and robot synergy; integration of existing/new software application (ERP); applying human resources optimally based on documented individual experiences.

BEIA already supplies big data and speech processing solutions to various customers (automotive, academia, car insurance, tourism, etc.) and will be able to sell the platform in a basic scenario as a nationwide SaaS service platform to public & private stakeholders in the profiling and analysis call-center business domain. In an extended scenario, the commercialization of the services of the platform will be enlarged in the Balkan/Danube region through BEIA's sales and partner's network. BEIA had several presentations of the solutions advanced within the project objectives, focusing on RPA for tenders.

2.3. Caretronic d.o.o.

2.3.1. The Problem Statement

Problem 1	
The problem of	Ticketing the issue to staff in healthcare organizations
The impact of which is	Increase in the time of detention of the issue and delay overall service processes of the healthcare staff
A successful solution would	Solution will offer ticketing of all maintenance work (technical failure, cleaning, etc.) right in the room of the patient / resident.

2.3.2. Scope and Objectives of Use Case

Project let healthcare workers, nurses, logistical, maintenance problem and categorize automatically using AI models. Solution will offer ticketing of all maintenance work (technical failure, cleaning, etc.) right in the room of the patient / resident. The personnel that notice a failure can document it immediately and notified the maintenance, logistical staff instantly. They are then able to respond and fix the issue while documenting the finished task in the room. Active and completed tasks are displayed with the sole purpose of offering a clear overview of completed work and active tasks for the healthcare staff.

2.3.3. Narrative of Use Case

We have data of 350 hospitals and this 112.000 of nurses, which daily report many requirements. Nurses have a problem which person to call to transport the patients from one hospital department to another and also which person to call for maintenance and they

do not always reach the right person also they need to call more times to reach the right person who is able to do that.

Second problem is that nurses need to call the patient's transport to exact rooms where they are sending the patient, then they need to fill out into the existing patient's transport software and also to fill out into the separate nursing documentation software that this patient has been transported to another department.

Third problem in COVID situation is that doctors needs to deal with a great variety of calls from patients' relatives. While patients are in the COVID departments relatives are not allowed to visit them since then the relatives are calling to the hospital to get the information. There are only few doctors for a certain amount of patients that is allowed to give information and has only 30minutes (or some small amount of time) per day time for giving the information to relatives. So, in this case the telephone is all the time ringing in each department and not all relatives receive the information about the progress of the relative patient.

2.3.4. State of the art

Nurses report problems about choosing the right person in the same shift for working with.

Mapping tickets to the correct support team is still assigned manually. If the support teams have a diverse category and distributions, then misaddressing increases response time and patients are not at right time where they should be (for instance in operation room).

Research for addressing tickets to teams automatically is a common endeavor.

2.3.5. Expected Outputs

In order to address this problem, we propose to use Artificial Intelligence (AI) methods.

We will develop AI/NLP models that help to understand health care staff intention. These AI methods include Natural Language Processing (NLP), Machine Learning/Deep Learning, and Optimization algorithms. Developing advanced algorithms of artificial intelligence, combining classical machine-learning and deep learning.

The novel methods used in the development of will be contributed to scientific knowledge in the form of research articles. Developing a highly accurate system will cut down time-to-decision. With such a system in place, the rate of patient recovery will be significantly improved. Using the AI based service will fasten processes considerably.

2.3.6. Success Criteria and KPI'S

Improved success rate on assigning tickets comparing to human operators. Min %10.

A patient experience survey will be conducted. Min 3.5 is expected for each module and 4 for overall score.

2.4. Dogus Technology

Portable devices are brought to end consumer online and offline by many companies and platforms. In case of any problem encountered in products sold through these channels, consumer must follow one of the ways defined for repair processes, taking the product to the place of purchase, or taking the product to the contracted technical service along with contacting call centers (CC). The complexity of the processes mentioned above, the implementation of many different procedures is a challenge for companies in terms of customer satisfaction and personnel costs. In addition, 60% of the records coming to the Call Center are simple problems. Solving these problems through the call center itself creates a huge time and cost loss. Furthermore, customers need answers quickly at any time and without giving information repeatedly. These requirements for better customer experience become costly when enough live agents are employed. Since AI can do most of the customer interaction with auto responses, chatbots are a reliable resource for ticket systems [2, 3].

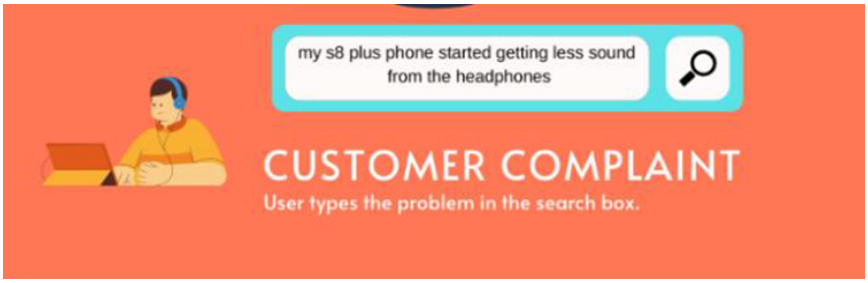
Thanks to the NLP supported smart platform approach, it is aimed to offer an NLP supported search function to customers over web and other platforms via utilizing brand, model, problem, and specific solution steps which are given & designed by the manufacturer. In this way, besides the service, call centers and other channels that customer will receive support, a platform specific to problem needs will be developed through a web platform, where customers can solve problems individually while the content is managed by the manufacturer. With this platform, it is aimed to achieve a personnel efficiency of around 20%. A 25% reduction in the number of customers coming to technical services and dealers is being targeted. In case customers cannot solve their problems, directing them to the right place with the platform will result in increased customer satisfaction.

Furthermore, smart routing functions which will be used during the development are suitable for use in different business domains and platforms. White goods, small household appliances are some examples. In addition, thanks to the parametric management, it also allows training for the personnel.

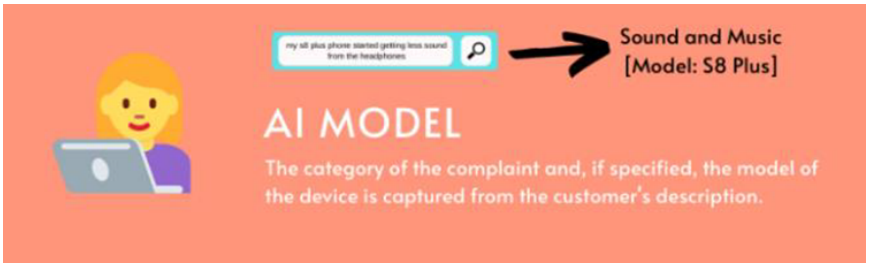
In this use case, as described in detail, an NLP supported ticket system for solving customer problems will be developed.

Consumer Electronics use case's solution will be SaaS using NLP to reduce consecutive and manual selections. Changes on reference data and entities will be updated automatically as shown below:

1. User complaint entry in a relevant form component in textual or voice.

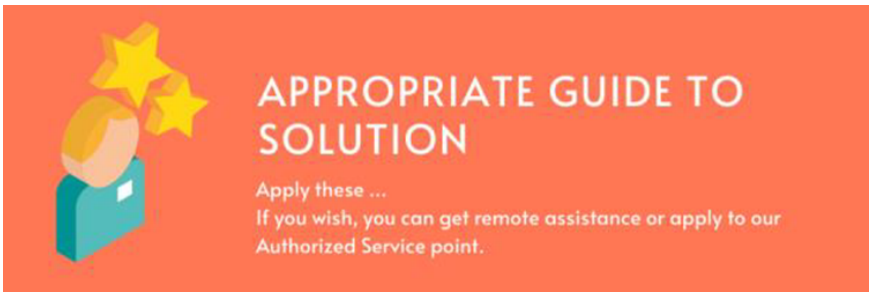


2. Data retrieved from step-1 sent to AI service and valuable data returned to app in a specified format.



3. If no device setting denoted, then model selection form could be represented.

4. Relevant detailed case of the problem verified by user.



5. User is guided with an appropriate solution step by step.

Our use cases main flow is represented by high level components of the framework in Figure 1. As shown in the figure, OMD framework will support the use case by its components both in management of the knowledge base and AI training phases. For a new installation for any company in the domain, a web application implemented in OMD will be provided for initialization of the application. In the application an administrator user role will configure the framework and if needed, upload new data and re-train models using the web application (Step 1). On the company's customer support application user interface, customers can comment through a search box (Step 2). AI processing components of the framework will allow model tests for the user comment and try to find an appropriate answer. Also, additional comments can be asked to customer to identify the problem. And in the process of writing comment, suggestions can be provided for user by dialogue management software to help user expressions (Step 3). Then a solution proposal will be responded back to client (Step 5). If customer is not satisfied with the solution, then a ticket will be submitted to company's ticket software through available integration components of the framework (Step 6). User feedback about willing to create a ticket or satisfied with the solution provided is maintained on the company's customer support application.

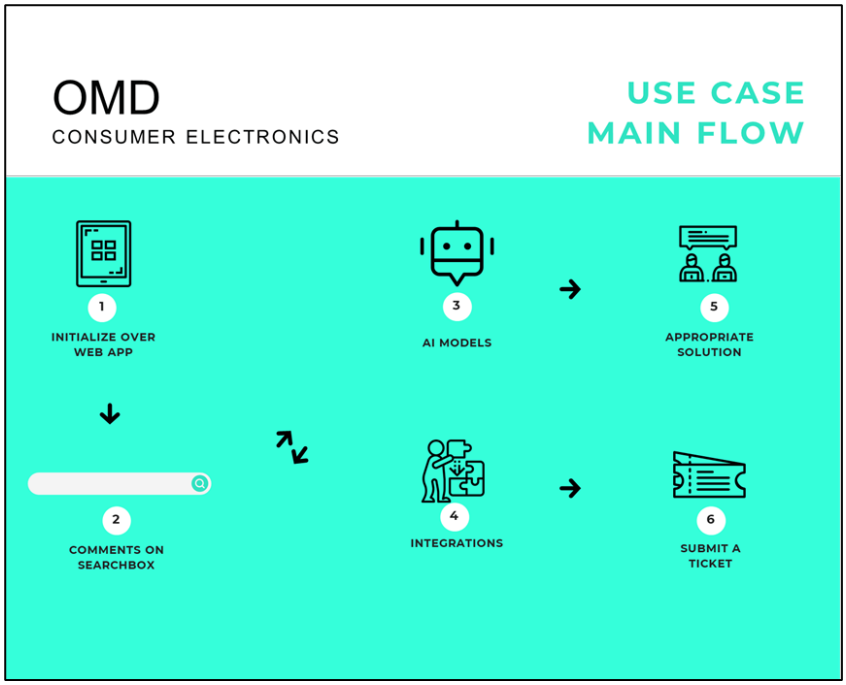


Figure 1: OMD Consumer Electronics Use Case Main Flow

2.5. Experteam

2.5.1 The Problem Statement

In Information Technology (IT) support, customers' problems and change requests are commonly managed in the form of tickets. These tickets may be completely in textual format such as e-mails or they may consist of a hybrid of textual descriptions, error messages and structured information that are chosen from a web form. There are early studies that investigate the feasibility of deep learning based text classifiers for automatic categorization in which the number of categories can easily expand to over a few thousand. Category assignment usually requires expert knowledge and it is stated that categories for nearly 40% of the tickets need to be modified after initial assignment. In CNN based deep learning algorithms were applied for category classification from the ticket titles and showed that deep learning methods outperformed traditional machine learning and rule based approaches. In a follow up study authors focus on processing short and noisy text from users in software support tickets and develop a deep learning model for software product name extraction and linking. Of course labeled data and feature engineering also plays an important role in the performance of the DL models. Results show the applicability of DL algorithms in this domain, with an impressive business impact: IBM research AI has a total saving of

51629.04 hrs/annum and their system has served more than 700,000 tickets in production across the deployed accounts by the publication date.

Problem 1	
The Problem of	ensuring that the ticket, which must be completed within a certain time, is assigned to the right person
Affects	personnel planning, do not exceed the SLA period
The impact of which is	waste of time for customers and staff
A succesful solution would	Developing a machine learning based time to completion estimation system for effort and costs

Problem 2	
The Problem of	Completing the ticket as soon as possible without exceeding the SLA terms
Affects	cost control and increasing the level of customer satisfaction
The impact of which is	Increasing the cost of the company
A succesful solution would	Developing a machine learning based time to completion estimation system for effort and costs

2.5.2. End-users and Stakeholders Description

Name	**Represents**	**Role**
Consumer	End Users	provides data
Product Company	Stake holder	development and evaluation of results

2.5.3 Expected benefits to End Users and innovation expectations

End User Benefit	**Supporting Features**
Consumer	The work is completed by the right person in a short time and there are no disruptions in the existing system.
Product Company	Minimization of costs due to completion time, personnel planning and customer satisfaction

2.5.4. Scope and Objectives of Use Case

The Use Case aims to implement and validate the performance of an AI-based technology that will ensure that the problem to be solved for the customers is done by the right person in a short time.

So the scope of use case includes:

1 – Taking the necessary data from an already existing business tracking system and processing it with Machine Learning techniques

2 – Integrating the results obtained after technical studies into the business tracking system

The goals set for this Use Case are:

1 - Reducing the time the customer waits for the problem to be resolved

2 - Provide time management and planning for staff

3 - Reducing the cost for the company

4 - Increase customer satisfaction

2.5.5. Narrative of Use Case

In the face of recent technology and the speed of the internet, businesses tend to utilize remote support at ever increasing rates. In this model, businesses do purchase the support they need in the management of such operations as infrastructure, IT, financial accounting, logistics, human resources, etc. remotely. To meet this demand, the supply of remote support is also increasing in the number of businesses, where experts of various areas do the support service. There is, however, a need towards the fast processing of each call on the demand side, and the effective management of resources on the supply side of the businesses. Our project aims to develop a software tool that helps the service provider to use their resources effectively, to provide agile solutions, to conserve their knowledge base, to allocate each call unmistakably to the corresponding expert, as well as in the solution of the particular problem at hand. This will shorten the time and reduce the cost of operations, avoiding repetitions. Increasing the overall efficiency, our project increases customer happiness.

To develop Tickota we analyze technologies that will shape the final system. AI with NLP and classification algorithms are used for the classification of tickets. Past support requests that are solved correctly are used to feed them. We hereby solve problems through examples in the past, without interrupting the work while the need for an allocating person disappears, minimizing time and resource use, as well as human errors. The final system serves as an end to end management tool and integrates as many companies as possible. Therefore, it should incorporate data from other systems, working with any ERP or internal software of companies, and be scalable with the benefits in time, cost, efficiency or accuracy thanks to the innovations of this project. This system then provides an efficient solution to the customer from the moment of the call onwards. Once the customer makes the call, this generated ticket will be analyzed, differentiating structured and unstructured data. Structured data are; company information, agreement details, time of ticket. Unstructured data are textual descriptions. Finally, a detailed feature vector will be created for each expert based on their competencies and previous experience. With these, each expert's eligibility, cost and time to resolve the ticket will be dynamically and optimally estimated.

In short, by using AI and optimization we generate the functions of ticket categorization and prioritization. We also tackle agent assignment and scheduling tasks. Furthermore, we predict their workload and optimize costs.

In our use-case;

- The billets/tickets opened in accordance with the support demand get analyzed using NLP, and categorized with classification algorithms to be automatically assigned to the right personnel.
- Data generated in the system on those support demands constitute the training set of machine learning models. In case the solution to an incoming call already exists in the system, this solution is automatically matched with the incoming ticket.

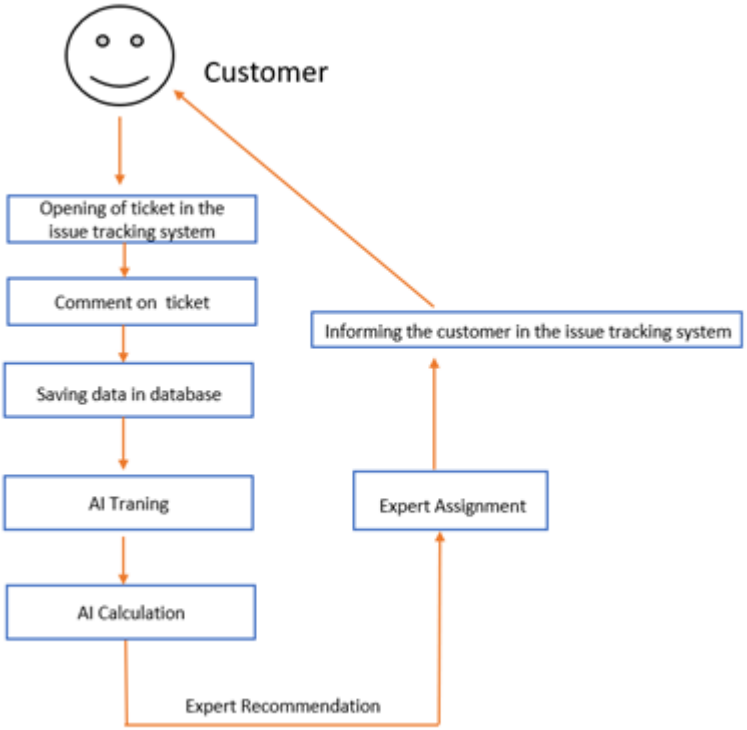
2.5.6. Use Case Conditions

Use Case Condition	
Assumptions	Issue tracking system is already in use by the company.
Prerequisites	The results of the processed data taken from the databases should be integrated into the tracking system.

2.5.7 Actors

Name	**Actor Type**	**Actor Description**
Customer	Human	End users define the ticket to the issue tracking system for their problems in the system.
Expert	Human	staff providing software support for the pop-up ticket
AI Agent	System	Making sense of the data received from end users, finding the right person and integrating with the tracking system
Issue Tracking System	System	Platform already in use by the compnay.

2.5.8. Use Case Diagram



2.5.9. Scenarios

The Issue Tracking System, which provides communication with customers, is used by the company. Successful service request management relies on five steps when end users access a service desk with requests:

1-)The system creates a ticket and pushes it to a central repository

2-)The category/subject for this ticket is determined (automatically or by an administrator)

3-)The ticket is prioritized and routed to the correct agent

4-)The ticket has been resolved

5-)Customer informed

In the second and third step here, AI/ML will be used to forward the ticket to the correct preference. After the ticket is opened, it is planned to reach the goal by using the data inserted into the databases.

In the AI/ML step, the data pipeline will run, and then the training will start with the right algorithms. Optimization will be achieved while correct results are seen with calculations after the training. The process will be integrated into the tracking system so that the request will be assigned to the right person. The customer will be informed through the system where you have completed the expert work for the request and the job will be completed.

Thus, by reaching the target, customer satisfaction would be increased, and it would contribute to personnel planning and company cost.

2.5.10. KPI's

SLA coherency currently at around 91.5 % shall be increased to 95 % helping with time management. Total cost is reduced by 20%

2.6. Frontendart Software

2.6.1. The Problem Statement

During the maintenance phase of a software, several development tasks may arise from bug reports and feature requests. These tasks should be done quickly and effectively in order to close the reported issues as soon as possible. The assignment of the task (telling who will carry out the correction/modification) has a large impact on the time and cost required to perform it. There are many factors that need to be taken into account, usually too many for a human to make an optimal choice in all situations. Characteristics of the software, knowledge on the particular parts of the software and on the technology, general development skills and abilities, and the actual load of the developer may also affect the time and cost of the correction.

Problem 1	
The problem of	Assigning a maintenance task to a developer not familiar with the given module/system/technology
Affects	The system quality, maintenance time period
The impact of which is	Increased fix/development time, lower quality software
A successful solution would	Assign a developer who has enough knowledge in the given system/module/technology to perform the maintenance task properly and in time.

Problem 2	
The problem of	Assigning a complex maintenance task to a developer with weaker skills/abilities
Affects	The system quality, maintenance time period
The impact of which is	Maintenance tasks are delayed, the quality of the software is lower than expected
A successful solution would	Take into account the developers' abilities during task assignment..

Problem 3	
The problem of	Assigning too much maintenance task to a single developer
Affects	The maintenance time period
The impact of which is	Maintenance tasks are delayed, "wall time" of fixes and enhancements gets long while some other developers has free capacity
A successful solution would	Check the developers' load when assigning the tasks in order to reduce the overall expected time period of performing the current maintenance tasks.

2.6.2. End-users and Stakeholders Description

Name	Represents	Role
Project Manager	End Users	Provides data and evaluate pilot studies
Quality Manager	End Users	Evaluate pilot studies
Developer	Stakeholder	Evaluate pilot studies

2.6.3. Expected benefits to End Users and innovation expectations

End User Benefit	Supporting Features
Project Manager	Better utilization of maintenance task resources, cost reduction, shorter time-to-correct intervals
Quality Manager	Increased quality of fixes and enhancements, less regression bugs
Developer	Balanced load, less tasks outside of/far from personal abilities/skills

2.6.4. Scope and Objectives of Use Case

The Use Case aims to develop and validate an AI-based technology that optimizes maintenance task assignment in the maintenance phase of software development. Thus, the scope of the use case includes:

1- Support of a software development project in maintenance phase at a company that has historical data on the current development project, or similar development projects.
2- Suggestions on maintenance task assignment of a software.
3- Evaluation of maintenance task assignment suggestions.

The objectives set for this Use Case are:

1- To reduce the average time from the reporting to the close of a bug or feature request.
2- To balance the load of the available developers.
3- To assign tasks to a developer that best matches their skills/abilities/knowledge.
4- To reduce the overall cost of regression bugs.

2.6.5. Narrative of Use Case

There are many ways to detect software maintenance related flaws in the software. They need to be corrected; but who is the best for carrying it out? Answering this question seems to be easy at first: the detected flaws usually point to a particular place in the code, so a developer can be assigned (e.g. the one who last modified that part, probably causing the issue in the

first place). However, there are many factors that could undermine this simple approach. First, assigning too many maintenance related tasks to a developer can overload her, while others may run out of tasks. Next, the knowledge of the developers about the particular code part should also be taken into account: the developer who might have changed the code is usually more familiar with it than the one who committed the latest changes. The overall performance of the developers may also count. For example, the one whose codes are usually more error prone might not be the best choice for correcting a bug. Besides these, there might be other considerations when the improvements are assigned to developers. One might optimize, for example, for spending the least amount of time. In other cases, expense might matter more. In some other cases one might be interested in widening peoples competences when it comes to the code.

FrontEndART's source code quality management system called QualityGate (https://www.quality-gate.com) is able to monitor the evolution of the software and to detect maintenance flaws in it. This platform already has a built-in recommendation engine, called code advisor, that is able to list code fragments and recommend correction tasks with a suggestion for the best candidate to fix the issue. However, feedback on the recommendation system has shown that the assignment is far from optimal. Assigning bugs to developers in an optimal way is a hard task where many attributes of the code, the flaw, the developers, and the project or the organization have to be considered. Furthermore, not all of these attributes can be quantified. Also figuring out the criteria of an optimal assignment can be challenging as well. This renders the classical optimization methods almost useless.

The main goal of the use case is to develop a solution for assigning source code maintenance tasks to developers in a way that is optimal from the perspective of a particular set of criteria.

The solution would be based on integrating the project's outcomes into the QualityGate source code quality management system. It would enable machine learning algorithms and artificial intelligence methods to learn how to optimally assign different maintenance tasks to individual developers. Not that it would just learn how to do it, but it will also continuously improve itself by getting and incorporating feedback from the developers. QualityGate would be integrated to ticketing systems as well, so that the use of these features could be channeled into the normal development processes. To be able to improve, QualityGate needs to be able to channel the feedback coming from the ticketing system into the machine learning algorithm. For example, if the assignee or other parameters of a ticket changes the system will learn from it, and make better suggestions the next time.

2.6.6. Use Case Conditions

Use Case Condition 1 - Data is available	
Assumptions	The software project is in maintenance phase, bug reports and feature requests are filed against the software.
Prerequisites	There is historical data on the project activities, software quality, developers, and other similar projects.

2.6.7. Actors

Name	**Actor Type**	**Actor Description**

Team lead	Human	Personnel who is responsible for task assignment in a project.
QualityGate	System	A quality management platform with integrated/connected ticketing system and the ability to automatically assign (suggest) maintenance tickets to developers.

2.6.8. Scenarios

A company uses QualityGate to monitor the quality of its developed software. The software is actively maintained, bug reports and feature requests are continuously filed against the software in a ticketing system. When a new ticket arrives, it is investigated and categorized, technical attributes are filled. Then, a new maintenance task is created. The management wishes to optimize maintenance task assignment. The corresponding module of QualityGate (trained on past data), takes into account the characteristics of the software modules related to the task, the currently available developers, their past activities, current load, and proposes an optimal assignee for the maintenance tasks.

2.6.9. KPI's

The overall maintenance costs (regarding the tasks handled by this method) will be reduced to 80% or less of the original level.

The average "wall time" period of maintenance tasks (regarding those handled by this method) from reporting to closing will be reduced to 80% or less of the original length.

2.7. FTP PORTO

2.7.1 The Problem Statement

Finding the right product online and being able to customize it, has always been a relevant and distinct factor for clients. Whether on the functional side or aesthetics, customers have particular needs and when those options are available, they can be the difference between buying the product or not. However, the quantity of available products and the ramification of variations for each one, can turn the flexibility of choices into a complex and time-consuming search. Finding the right product with a starting point preset based on a simplified user search, can help mitigate the disadvantages of a vast configuration.

Problem 1	
The problem of	Consumer finding the right product in an immense list of possible items on e-commerce shop
Affects	Consumer time and user experience
The impact of which is	Not finding the right product, quits the search and don't buy anything
A successful solution would	Show the most suitable results to the consumer supported by a simplified interaction

Problem 2	
The problem of	Large list of configurable properties that consumer can use to personalize the product online
Affects	Consumer time
The impact of which is	Quits the configuration and don't buy anything
A successful solution would	Present an already configured product as a starting point, based on the consumer preferences and previous orders

2.7.2. End-users and Stakeholders Description

Name	Represents	Role
Consumer	End Users	Provides data and tests interaction
Product Company	Stakeholder	Evaluate results

2.7.3. Expected benefits to End Users and innovation expectations

End User Benefit	Supporting Features
Consumer	More accessible and flexible way of choose suitable products without wasting too much time
Product Company	More product sales from consumers that don't quit during product search

2.7.4. Scope and Objectives of Use Case

The Use Case aims to implement and verify the performance of an AI-based technology that facilitates the process of product search for consumers online. Thus, the scope of the use case includes:

1 – Addition of new functionalities on an e-commerce platform already developed by a shoe manufacturer company.

2 – Presentation of suitable products based on accessible user interaction.

3 – Aid product configuration based on user preferences and historic.

The objectives set for this Use Case are:

1 - Reduce the average time the consumer takes to find the products he is interested in.

2 - Reduce the average time to personalize products.

3 - Give a better user experience based on accessibility.

4 - Increase product sales.

2.7.5. Narrative of Use Case

E-commerce has seen an exponential demand due to a vast number of reasons, including accessibility factors and pandemic restrictions. Although filtering tools are often to narrow product searching, the current systems do not offer an optimized way of presenting results based on the user commands or preferences. Additionally, for several types of products, the outcome of their personalization can be very dependent on the visual result. Therefore, the visual simulation of the final product is also vital for the consumer perspective of what he will get. The advancements and accessibility of real-time technologies can also be used in this context, in order to recreate the end result of a product not yet assembled or manufactured.

Additionally, the human interaction with these platforms lacks some simplified and agile workflow, due the complex nature of the options available in these types of interfaces. Online shops have also been a great example of diverse products and with the help of AI integration this process can be even more straightforward. The visualization techniques could be diverse, like using overlapping images (transparent PNGs) or using 3D models (pre-rendered or real-time), but the research of the ideal product is often based merely by observing a list of items and experimenting possible variations.

Recent developments in Artificial Intelligence fields like Natural Language Processing and Deep Learning have evolved dramatically in the last decade, aiding device users in different types of scenarios. One of them is in the Human-Machine interaction context, where the complex processes can be simplified, and output data could become more relevant and impactful for the user. On the other hand, Combining the strength of AI to help consumers get what they need on online stores, will reinforce this demand and boost company sales.

In this use case, it will be used in the footwear industry scenario with customizable shoes that are available in an e-commerce platform. The business model can be aimed for retailers like shoe stores (B2B) or for regular end consumers (B2C). In this case, it's possible to segment the process in the following parts:

- An AI agent is available on the platform that can react to text and voice commands. This received input data can then be used to display a list of possible products related to consumer requests.

- Recommendations and pre-configured variable products that the user can adjust further are presented on the e-commerce platform.

- Real-time 3D models and materials that represent the configured product are displayed, being possible to edit and view it from any angle.

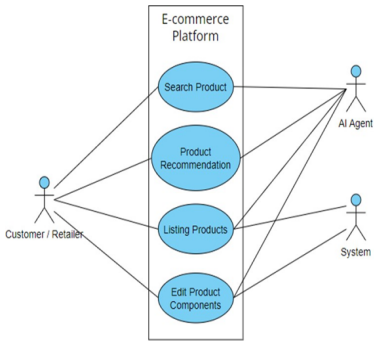
2.7.6. Use Case Conditions

Use Case Condition – E-commerce Plataform Access	
Assumptions	The e-commerce platform is already developed and in use by the company.
Prerequisites	The company grants access to their platform API for integration.

2.7.7. Actors

Name	Actor Type	Actor Description
Customer/Retailer	Human	The end user that searches for products and make orders online.
AI Agent	System	Integrated artificial intelligence agent that establishes the interface between the customer/retailer and the e-commerce online shop.
E-commerce System	System	Online shop platform already in use by the company.

2.7.8. Use Case Diagram



2.7.9. Scenarios

The main project goals are focused on the optimization of variable product listing in an e-commerce scenario and to make the interaction of all the processes simpler and intuitive. The customer/retailer can use text or voice commands to search for shoes that meet some criteria and the AI agent returns a list of products, including recommendations and pre-configured results. The system stores and manages all information, updating product data and model visualization in real-time.

The major challenge in this use case scenario is the integration of human-machine interaction on a footwear e-commerce platform that has an immense number of products and inherent variations. To give an adequate response to the user requests and keep interacting with him until the final result is conceived, a lot of effort is necessary in the correct interpretation of data. Also, a system that displays recommended starting points on the product and respective component combinations, needs to collect and adapt to the consumer preferences, and the source of this information might not be so linear to work with. Therefore, the use of Artificial Intelligence is very important in this context, in order to prevent the search of the ideal shoe be a cumbersome and overwhelming task. And in order to meet the client expectation, the virtual representation of the final configured product should be displayed and edited in real-time.

2.7.10. KPI's

Reduce the end user time on the platform during the selection and customization phases by 35%.

Increase the user satisfaction with the platform by 50%.

2.7.11. REFERENCES

[1] Pallant J., Sands S., Karpen I. (2020). Product customization: A profile of consumer demand. Journal of Retailing and Consumer Services 54(2):102030

[2] Novshek W., Thoman L. (2006). Demand for Customized Products, Production Flexibility, and Price Competition. Journal of Economics & Management Strategy 15(4):969-998

[3] Desikan, B. (2018). Natural Language Processing and Computational Linguistics. Packt Publishing

[4] Verdon, J. (2021). Forbes - Global E-Commerce Sales To Hit $4.2 Trillion As Online Surge Continues, Adobe Reports - https://www.forbes.com/sites/joanverdon/2021/04/27/global-ecommerce-sales-to-hit-42-trillion-as-online-surge-continues-adobe-reports

[5] Tongxiao Z., Agarwal R., Lucas H. (2011). The Value of IT-Enabled Retailer Learning: Personalized Product Recommendations and Customer Store Loyalty in Electronic Markets. Management Information Systems Quarterly Vol. 35, Iss. 4

[6] Marinho I. (2020). 3D Visualizations in Web Based Environment. Master Thesis - Faculdade de Ciências da Universidade do Porto

[7] Tarla, N. (2021). Empowering Organizations with Power Virtual Agents. Packt Publishing

[8] Pereira D. (2019). NIKEID: Case Study on Footwear Customization. ISCTE Business School-https://repositorio.iscte-iul.pt/bitstream/10071/19421/4/master_david_nunes_pereira.pdf

2.8. Strategy Big Data

2.8.1. The Problem Statement

One of the biggest challenges in Telemarketing is leveraging the success of cold calls. The key to an effective and successful call depends largely on the caller's ability to quickly establish rapport with the customer, to initiate relevant conversations that meet their needs. The salesperson continues to play a vital role in the Telemarketing sales process. The customer's socioeconomic affinity, cultural affinity and mood are factors that influence the success rate of the sale. Currently, these factors cannot be applied to cold calling as very limited customer profile information is available. At OMD, new techniques will be implemented, based on the analysis of external sources to better identify the mood, culture and socio-economic profile of a new customer - a priori - in order to better match the customer with the most suitable agent and product campaign. SBD will thus generate an extraordinarily innovative new model to increase the level of affinity (commonly referred to as rapport in the industry), a priori, between agents and potential customers.

There is solid research that concludes that the relationship established between the salesperson and the customer has positive effects on trust, loyalty, likelihood of purchase, as well as customer disclosure. There are cultural and economic factors, as well as sociolinguistic behaviors that also affect the management of this relationship. In this regard, some key challenges are identified to improve the success rate in cold calling based on empathy and the relationship established between agent and customer.

2.8.2. End-users and Stakeholders Description

Name	Role
Telemarketing Audit Supervisor	Ensure quality standards in call auditing
Telemarketing Audit Manager	Manage teams of supervisors
Sales Service Manager	Coordinate sales teams
Sales agent	Sell products to customers
Customer	Buy services
End customer	Offer services

2.8.3. Expected benefits to End Users and innovation expectations

End User Benefit	Supporting Features
Telemarketing Audit Supervisor	Significant increase in audit capacity and effectiveness, without requiring resources
Telemarketing Audit Manager	Better results with fewer resources
Sales Service Manager	Higher sales ratio and shorter operation times

2.8.4. Scope and Objectives of Use Case

SBD is focused in omnichannel contact centre services. SBD aims to provide a use case and will be focused in generating tools and components for enhanced association of agents with potential customers. These tools will take into account not only NLP-based techniques to better profile agents, but also external, non-structed data sources to generate profiles of customers beforehand, based on socio-economical-cultural features that may impact the affinity of a customer with an agent and product/service. We are planning to create an empathy data base.

First, it is required to design a system that can provide a profile of an agent with respect to the empathy and potential affinity it may have with potential customers. The challenge is to define appropriate measures and associated tools for a systematic evaluation.

Secondly, it is required to predict the degree of affinity and the cultural/economic/social profile of a new customer in a cold call. Cold calling is mainly based on basic and deficient demographic and geographic databases. However, there are new approaches that can provide improved information on mood and cultural / economic / social profile for a given geographic or demographic target.

Finally, there is a need to design new models that can provide the best customer-agent-product matching. That is, taking into account not only the affinity / potential customer-agent relationship, but also which products are most likely to be of interest to a potential customer. For this, other models and tools will be taken into account.

2.8.5. Narrative of Use Case

Case 1. Designing a potential affinity-based agent profiling system

The objective is to design and implement a set of tools to catalog agents by cultural and economic factors, as well as sociolinguistic behaviors.

To this end, SBD will carry out research and development of a set of models, components and techniques to analyze the emotional footprint of agents, based on historical data,

unsupervised learning techniques (Clustering), speech analysis and NLP / NLG / NLU (Natural Language Processing/Generation/Understanding) algorithms.

Case 2. Designing a system for predicting the socio-economic and cultural profile of a potential customer.

The objective is to design and implement a set of components to catalog new customers, increasing the success rate of "cold door" calls.

To this end, SBD will carry out research and development of a set of models, components and techniques (focused on NLP/NLG/LNU, Deep Learning and Machine Learning) to generate a profile with cultural, economic and sociolinguistic factors (a priori) of new customers. This objective is focused on developing different techniques that allow the enrichment of the available databases (with basic demographic and geographic data of potential customers) with the systematic analysis of external sources. Additionally, the customer profile will be refined from speech analysis.

Case 3. Design a new customer-product-agent matching model based on potential affinity.

To this end, SBD will conduct research and development work on a set of components and services with the goal of creating the optimal association: which agent should be assigned to sell a specific product to a specific customer. To do this, in addition to the components associated with the above objectives, a system will be generated to identify which product makes a successful sale more likely.

2.8.6. Use Case Conditions

Use Case Condition 1	
Assumptions	Designing a potential affinity-based agent profiling system
Prerequisites	historical data, unsupervised learning techniques (Clustering), speech analysis and NLP / NLG / NLU (Natural Language Processing/ Generation/Understanding) algorithms

Use Case Condition 2	
Assumptions	Designing a system for predicting the socio-economic and cultural profile of a potential customer.
Prerequisites	models, components and techniques (focused on NLP/NLG/LNU, Deep Learning and Machine Learning)

Use Case Condition 3	
Assumptions	Design a new customer-product-agent matching model based on potential affinity
Prerequisites	creating the optimal association: which agent should be assigned to sell a specific product to a specific customer

2.8.7. Actors

Name	Actor Description
Team lead	Development Manager
Developers	Specialized developers

2.8.8. Scenarios

OMD was born with the objective of creating a powerful software tool that will help providers in different fields to use their resources efficiently. OMD is a product that will help companies to assign the most suitable agent for a specific service demand efficiently and remotely.

OMD will analyze different approaches to create efficient workflows for dynamic priority management in customer service teams. Profiling customers and agents based on mood, cultural and socio-economic dimensions based on data analysis will help to process new customer dimensions, designing a methodology that captures rapport potential and emotional state, increasing the quality of the customer experience.

OMD will carry out research and development work on key topics such as category classification, emotion classification, semantic capabilities to easily extract information from unstructured data, topic detection, demand and service level classification, intent classification, entity recognition and linking, request summarization and standardization, agent classification, solution classification as well as dynamic prediction of request "completion time" using state-of-the-art Artificial Intelligence, Machine Learning and Deep Learning models. The OMD framework produced in this project will quickly help many sectors to effectively use AI Models, which will contribute to many sectors using it effectively for the improvement of their services.

2.8.9. KPI's

As a result of the research and development tasks, SBD will generate:

§ A set of models, components and techniques to analyze the emotional footprint of agents, based on historical data, unsupervised learning techniques (Clustering), speech analysis and NLP / NLG / NLU (Natural Language Processing/Generation/Understanding) algorithms.

§ A set of models, components and techniques to define the emotional footprint of new customers, based on socio-economic characteristics available in advance (i.e. income levels, cultural background ...) based on the analysis of external sources.

§ A set of components and services with the objective of creating the optimal partnership: Which agent should be assigned to sell a specific product to a specific customer.