# Project Progress Report Annex

Version 22, January 2024

Foreword

# 2023-H2 Project Progress report

OMD

OPTIMAL MANAGEMENT OF DEMAND

Edited by: Hatice Betül HERSEK, PMP

Date: 25.03.2024

## Project key data

### ACRONYM and full-length title

|  |  |
| --- | --- |
| 20003 | OMD |
| Program Call | ITEA 3 Call 7 |
| Full-length Title | Optimal Management of Demand |
| Roadmap Challenge | Smart Industry |

### Project duration and size

|  |  |  |
| --- | --- | --- |
| Size | Effort: 66.03 PY | Costs: 2.2 M€ |
| Time frame | Start: 2022-01-01 | End: 2024-12-31 (36 months) |

### Coordinator

|  |  |
| --- | --- |
| Türkiye | Experteam |
| Type | Small and Medium sized Enterprise |
| Contact Person | Dr. Demet Seyhan |
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### Project Status

|  |  |
| --- | --- |
| Latest FPP | Change Request (27-01-2024) |
| Latest PPR | 2023 Semester 1 |
| Latest Review | OMD #1 (a.m.) (23-06-2023) |
| Upcoming Review | OMD #2 (a.m.) (29-02-2024) |
| PCA status | PCA Signed.pdf (Signed: 30-03-2023) |

### Consortium

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Country | Funding Status | National Coordinator (Company) | Total Effort (PY) | List of Partners |
| Austria | Not funded (N) | George Suciu (BEIA Austria) | 3 PY | BEIA GmbH |
| Hungary | Funded (Y) | Tibor Bakota (FrontEndART Software Ltd.) | 5 PY | FrontEndART Software Ltd., University of Szeged |
| Portugal | Funded (Y) | Goreti Marreiros (Instituto Superior de Engenharia do Porto (ISEP)) | 15 PY | FTP - Com. Equip. Inf. Lda, Instituto Superior de Engenharia do Porto (ISEP) |
| Slovenia | Funded (Y) | Simona Brezar (Caretronic d.o.o.) | 11 PY | Caretronic d.o.o. |
| Spain | Funded (Y) | Alberto Oliva (Strategy Big Data) | 13 PY | Strategy Big Data |
| Türkiye | Funded (Y) | Arda Ödemiş (ARD GROUP INFORMATION TECHNOLOGIES INC.) | 20 PY | ARD GROUP, DOGUŞ BILGI ISLEM VE TEKNOLOJI HİZMETLERİ, Experteam, Hiperlink Eğitim İletişim Yayıncılık Gıda San. Paz. ve TIC. LTD. STI. |

## Project Acronyms

|  |  |
| --- | --- |
| AI | Artificial Intelligence |
| ARR | Automated Request Routing |
| DL | Deep Learning |
| GDPR | General Data Protection Regulation |
| HLA | High Level Architecture |
| ITSM | Information Technology Service Management |
| KPI | Key Performance Index |
| Min.s | Minutes |
| ML | Machine Learning |
| NLP | Neuro-Linguistic Programming |
| OMD | Optimal Management of Demand |
| PCA | Project Cooperation Agreement |
| PPR | Project Progress Report |
| PT | Portuguese |
| SDM | Service Demand Management |
| SoTA | State of The Art |
| STG | ITEA Steering Group |

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1. Project one-page description

OMD is a product that helps businesses to assign the correct agent to a specific service demand effectively, and remotely. In our speedy internet era, it meets the need of a fast processing of each call on the demand side, and the effective management of resources on the supply side of businesses. Increasing demands and time pressures accelerated by the pandemics make organizations ask for new automations to proactively manage their environments. SDM tools are important to do so, and existing products focus mainly on IT support: ITSM. The ITSM tool market can be considered mature as in the number of products, yet in AI capabilities they are in their infancy. Meanwhile, we need advanced approaches for optimizing demand management and a better utilization of resources in many domains. However, there is no general framework providing SDM in multiple sectors such as judicial, health, sales, marketing or manufacture. The OMD will address the high demand for online service support for numerous different sectors due to the pandemics and thus will create a significant business impact.

OMD embodies a number of technological innovations aimed at providing cross-domain enhanced tools, components and services for efficient service demand management and remote customer support. By applying novel approaches mainly from AI, ML/DL, and NLP, OMD will significantly impact the market, providing cross-domain breakthroughs that will be validated in nine domains: software support, justice, healthcare, consumer electronics, e-commerce, telemarketing, manufactury, logistics and software development.

Our innovation applies novel AI solutions to support a general SDM framework, considering many parameters related to request, service experts (agents), customer, and company from various domains. Bringing together technology providers and use case owners from different sectors, OMD goes far beyond the state of the art. OMD strengthens the concept of Cross-Domain Cognitive Service Management for enhanced customer satisfaction, user experience, and cost savings. OMD will analyse different approaches to create efficient workflows for dynamic priority management in customer support teams. The profiling of customers and agents based on data-driven social mood analysis, will help to process new dimensions of customers, designing a methodology that captures emotions that will increase the quality of the customer experience. OMD will perform research and development in key topics: 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 and dynamic “time to finish” prediction using state-of-the-art AI and ML/DL models. Furthermore, we plan to open source some core components of the project to facilitate its cross-domain sustainability.

The OMD framework produced in this project will rapidly contribute to many sectors effectively using AI models to improve service as a CSM approach. With the remote working model now more intensely in our lives, companies providing remote support will dramatically increase in number and so our product will be high in demand.

1. Project overall status
	1. Top 4 overall targeted innovations

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| **1. Framework for a multi-domain service management software** |

***Main contributors***: Doğuş, Hiperlink, Experteam and All

***Short description of innovation and the State-of-the-Art***:



In our journey to create a multi-domain service management software framework, significant strides have been made. A collaborative effort led by main contributors have culminated in the consensus on a common reference architecture. This architecture represents a monumental success in team collaboration, accommodating a diverse array of use cases within a unified structure.

Initially, the architecture was designed to allow other use cases to connect as plugins, which posed challenges such as the need for a microservice architecture and adherence to specific coding standards; this setup meant that while use cases operated on the same server, they were only partially independent. Questions arose regarding the sharing of development costs and confidential data. The subsequent iteration proposed that models within the same hosted environment should communicate via a hosted inference API, sparking discussions on who would provide the necessary resources.

Ultimately, it was agreed that use cases should be independent, interconnected through an API gateway. This architecture facilitates seamless communication between different use-case domains, ensuring flexibility and scalability. This final decision marks a pivotal point in our project's development, offering a robust foundation for future expansions.

Our framework introduces novel AI solutions to enhance a general SDM framework across various domains, addressing a multitude of parameters related to requests, service experts, customers, and companies. This innovative approach, which integrates technology providers and use case owners from diverse sectors, propels OMD beyond the current state-of-the-art. Despite ITSM's leading position in technology adoption, the use of AI remains nascent. OMD's vision extends the deep application of AI technologies across ITSM and other domains by facilitating the sharing and transfer of AI models.

The project emphasizes ticket prioritization, integration, and automated routing, with anticipated successes set to significantly uplift the entire system. Moreover, the strength of OMD lies in its collaboration with partners across various use case models, necessitating a cross-domain service to achieve interoperability and utilize the OMD infrastructure across multiple cases. This innovation ensures that domains with similar model structures can collaborate effectively, establishing a cross-domain service structure that enhances project development flexibility across different fields.

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| **2. Optimization via AI-supported assignment tools** |

***Main contributors***: Hiperlink and all

***Short description of innovation and the State-of-the-Art***:

Optimization via AI-supported assignment tools is pivotal in streamlining operations and enhancing efficiency in call centers or help desks. The core objective is to optimize the assignment of requests or tickets to agents leveraging AI technologies. This innovation begins with a thorough analysis of the distribution and characteristics of incoming requests, utilizing data analytics to grasp the nature and variability of these requests over time.

By employing advanced AI methodologies, including natural language processing (NLP), machine learning (ML), and deep learning (DL), OMD aims to improve the prediction and assignment processes significantly. These technologies enable a more nuanced understanding of both demand patterns and agent capabilities, including their specialized skills and availability. This approach moves beyond traditional demand-supply models, integrating multifaceted constraints and parameters such as agent profiles and external factors like weather, to refine service level agreement (SLA) predictions and optimize resource allocation.

The solution adopts a mixed integer programming approach, tailored for scheduling challenges involving multi-skilled agents. This method not only considers the current tickets but also incorporates predictive insights about future requests, facilitating a more dynamic and responsive task assignment system. By analyzing task duration metrics and agent performance data, along with employing predictive models like Long Short-Term Memory (LSTM) networks for demand forecasting, the system can assign tasks more efficiently. This strategy aims to reduce overall task completion time and balance agent workloads, thereby minimizing service costs while maintaining or enhancing customer satisfaction levels. Through this innovation, OMD not only streamlines operations but also sets a new standard for intelligent resource management in service-oriented sectors.

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| **3. Use of NLP for topic classification** |

***Main contributors***: DT, XT, USZ, SBD

***Short description of innovation and the State-of-the-Art***:

The current state-of-the-art in probably most NLP applications is to utilise a large pre-trained language model and either fine-tune it in a domain-specific downstream task with a number of labelled examples, or use a meta-training strategy, e.g., few-shot learning without actual model weight updates. The latter requires much less labelled data than the proper fine-tuning, however, works only with relatively large and carefully pre-trained language models.

The global OMD project involves mainly classification tasks in various domains. In the Software Development use case, USZ together with the use case owner, FEA develops an NLP-based AI solution to assign source code bugs to developers. This task can be considered as a classification over the available developers considering a complex set of features describing, among others, the code, the bug, and the developers themselves. The main idea in this, and also in other classification tasks is to develop AI-based solutions relying on pre-trained language models, namely one of the many variants of the BERT or the GPT families of language models. The particular choice of model and fine-tuning strategy depend on the specific task at hand.

DOGUS
Dogus has successfully developed an AI model that outperforms baseline models in terms of efficiency and effectiveness. Technically this is a multilabel classification model for issues using pre-trained models and finetuning.

 FastText text classification model used as a benchmark. FastText, developed by Facebook, is noted for its efficiency and ease of implementation, making it capable of fast performance and low memory consumption even with large datasets.

For evaluating text classification models, various score metrics like accuracy, precision, recall, and F-1 score are used. However, the macro F-1 score, which averages the F-1 scores of each class without considering the importance of each class, is preferred for imbalanced datasets. This makes it a more reliable metric in situations where all classes are equally important.
The trained FastText model achieved a macro F-1 score of 0.90 on a test dataset. Following FastText, more complex and advanced pre-trained natural language models have been employed, specifically the “dbmdz/bert-base-turkish-uncased” and “dbmdz/distilbert-base-turkish-cased” models from the Huggingface platform, which have been pre-trained for classification with Turkish data. In both model trials, the best scores are listed in the table below.

|  |  |
| --- | --- |
| **Model** | **Makro F-1 Score** |
| bert-base-turkish-uncased | 0.94 |
| distilbert-base-turkish-cased | 0.93 |

To gauge the model's performance in real-life scenarios, specifically with customer complaint sentences, it is believed that data from sikayetvar.com, which contains such customer complaints, will serve as a significant resource. Consequently, a project has commenced to scan the site for comments related to consumer electronics. After the data collection, it is planned to have the customers label the data, which will then be used to assess the model's effectiveness.

Efforts have been made to ensure the model can identify device models within sentences. Research into literature and keywords recommended by our advisor for Named Entity Recognition (NER) includes:

- Entity Linking
- Fuzzy Word Matching
- NER + Disambiguation
- NER using gazetteer lists
- Trie structures

Following these investigations, an application combining the advantages of these methods has been developed for entity extraction:

- An API has been developed using Autocorrect with Trie structures for word correction and BM25 for information retrieval from documents. Trie structures enhance fast search and automatic correction capabilities, while BM25 is utilised for extracting information from documents.

- This API has been developed using training data from various fields and is planned to be retrained and tested with OMD entity data.

Research into reinforced learning and human feedback has been conducted to improve the model based on end-user feedback. These studies demonstrate how human feedback can enhance model performance and how these techniques could be employed in future projects. Specifically, works such as "Deep Reinforcement Learning from Human Preferences" and "Training a Helpful and Harmless Assistant with Reinforcement Learning from Human Feedback" indicate that it is possible to refine models using human feedback. These approaches could contribute to making future artificial intelligence systems more effective and user-friendly.

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| **4. Recommendation system for issue assignment** |

***Main contributors***: All

***Short description of innovation and the State-of-the-Art***:

OMD introduces innovations across various use cases through the use of Artificial Intelligence (AI) and optimization techniques. Particularly, the fourth innovation titled "Recommendation System for Issue Assignment" aims to innovate the process of assigning issues within OMD. By integrating the most advanced ticket classification methods with the latest solutions for category and intent classification, this innovation seeks to achieve a new level of efficiency and precision in demand management processes. The AI-based recommendation system is designed to analyze incoming requests and intelligently route each issue to the appropriate person or team. Utilizing state-of-the-art approaches in natural language processing (NLP), machine learning (ML), and deep learning (DL), the system can deeply understand the content and context of requests. Thus, it ensures that issues are smartly assigned to the most suitable resolution partners, accelerating business processes and enhancing customer satisfaction. This innovation by OMD, especially targeted at ITSM and OSMTA use cases also aims to support the automation and optimization of demand management in more traditional processes like health and judicial services.

1. **Predictive Maintenance / Health Use-case**: AI algorithms can analyze historical data to predict when equipment or machinery is likely to fail. This enables proactive maintenance, reducing downtime and costs associated with unexpected breakdowns.
2. **Automated Customer Support / Electronics Use-case**: AI-powered chatbots and virtual assistants are increasingly used in service management to handle routine customer queries and provide 24/7 support. These systems can understand natural language, learn from interactions, and escalate complex issues to human agents when necessary.
3. **Service Ticketing and Routing / ITSM Use-case / OSMTA Use-case**: AI algorithms can analyze incoming service requests, categorize them, and route them to the most appropriate team or individual for resolution. This helps streamline the service process and ensures that requests are handled efficiently.
4. **Optimized Scheduling and Dispatching / Telemarketing Use-case**: AI algorithms can optimize scheduling and dispatching of service technicians based on factors such as technician availability, location, skills, and priority of tasks. This helps maximize resource utilization and minimize response times.
5. **Demand Forecasting / Telemarketing Use-case**: In service management industries such as hospitality and transportation, AI can analyze historical data and external factors to forecast demand accurately. This enables better capacity planning and resource allocation.
6. **Workflow** **Automation / Justice Use-case**: Recommendation systems for lawyer-case assignments take into account a number of important parameters such as location, practice areas of lawyers and characteristics of cases. In this way, it is aimed to make the legal system healthier by optimising the time and resources in assignments made by human or rule-based systems.
	1. Top 4 overall targeted business impacts

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| **1. EqualityInJustice Business Impact** |

***Short description***: The EqualityInJustice solution facilitates enterprise licensing for governmental bodies, including the Ministry of Justice, General Directorate of Police, and Union of Turkish Bar Associations. It is planned that the EqualityInJustice Cloud Application will be licensed to the 82 Bars and the Union of Turkish Bar Associations, with an end-user licensing model provided for attorneys participating in counselling assignments. This solution targets end users such as attorneys, law enforcement personnel, and Ministry of Justice personnel, while also aiming for international markets. Currently, there is no competition in AI/NLP integrated demand management systems within the justice domain.

***Main contributors***: ARD

***Market / competitors***:

There are 185.586 attorneys registered to the union as of December 2023 (6.3% more than one year earlier). End users (attorneys, law enforcement personnel and Ministry of Justice personnel) will be connecting the EqualityInJustice Cloud Application via the web application and mobile application, which will provide flexibility of usage. Furthermore, this business model will be targeted for other countries. There is no competition in the AI / NLP integrated demand management systems in the justice domain. Compared to the previous year, there has been an increase in our market potential. The number of current bar associations using our solution has increased by 2, resulting in a 5.1% rise, and the current number of attorneys has increased by 11,053, leading to a 6.3% growth.

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| **2. Health care Business Impact** |

***Short description***: EU Market - existing network of distributors

Caretronic has a strong international network of distributors mostly in EUROPE and all around the world. Based on the Caretronic has developed the business model and road to market that includes market introduction to hospitals, nursing homes, care organisations, telecom companies, our international distributors’ network.





In the highly competitive healthcare industry, establishing a unique differentiator can significantly impact business success.

Caretronic's extensive network of distributors, combined with its advanced technology solutions, can offer the following business impacts that set it apart from competitors:

* Wider Market Reach: Caretronic's global distributor network provides unparalleled access to healthcare institutions, including hospitals, nursing homes, and care organisations. This wide reach allows the company to penetrate diverse healthcare markets more effectively than competitors.
* Streamlined Market Introduction: Caretronic's established network simplifies market introductions. New healthcare products and services can be efficiently introduced to a broad customer base, reducing time-to-market and enhancing revenue generation.
* Enhanced Product Adoption: The distributor network facilitates quicker adoption of Caretronic's innovative healthcare solutions. With distributors familiar with local healthcare needs and regulations, the company can tailor its products to meet specific market requirements, increasing adoption rates.
* Global Expertise: Caretronic's international distributors bring valuable local knowledge and expertise. This knowledge helps the company navigate complex healthcare landscapes, adapt to cultural nuances, and stay compliant with regional regulations.
* Competitive Advantage: Competitors may find it challenging to replicate Caretronic's vast and well-established distribution network. This network provides a competitive advantage, making it harder for rivals to enter or gain traction in certain healthcare markets.
* Improved Customer Service: With local distributor support, Caretronic can offer prompt and effective customer service. This enhances customer satisfaction and loyalty, critical factors in the healthcare sector.
* Market Expansion Opportunities: The distributor network not only serves as a sales channel but also as a valuable source of market intelligence. Caretronic can identify emerging healthcare trends and expansion opportunities more readily through its network.
* Risk Mitigation: Distributors can help Caretronic manage risk in various markets. They understand local regulations, manage logistics, and navigate potential challenges, reducing the company's exposure to risks.
* Scalability: The existing distributor network provides a scalable infrastructure for growth. As Caretronic expands its product offerings or enters new healthcare segments, it can leverage its network's established infrastructure.
* Brand Credibility: Collaborating with respected international distributors enhances Caretronic's brand credibility. This trust in the distribution channel can positively influence healthcare organizations' purchasing decisions.

In summary, Caretronic's extensive distributor network serves as a potent differentiator in the healthcare business. It not only expands market reach but also streamlines market entry, enhances product adoption, and provides a competitive edge. This unique business impact can be leveraged to achieve sustainable growth and success in the healthcare industry.

***Main contributors***: Caretronic

***Market / competitors***:

Rauland, Ackerman, Tunstall

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| **3. Contact services, Telemarketing and Big Data Business Impact** |

***Short description***: Both the initial business model proposal and the estimates will have to be updated during the execution of the project. SBD proposes a sales model for contact process optimization services. OMD's services are also applicable to corporate clients and users of contact and telemarketing solutions in general. The following table shows the estimated sales of corporate and individual licences for OMD services.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **2025** | **2026** | **2027** | **2028** | **2029** |
| Corporate licences | 45 | 75 | 125 | 180 | 340 |
| Individual licences | 400 | 580 | 720 | 890 | 970 |

***Main contributors***: SBD

SBD will integrate OMD's results as part of its strategy to automate and optimize sales agent selection and sales agent prediction. sales agent selection and resource forecasting for Telemarketing and Contact centers based on customer characteristics (Speech-to-text, NLP, Entity Extraction, sentiment analysis) and product characteristics (Target, audience and trends).

SBD will improve with OMD the customer experience, by analyzing external sources to better identify the mood, culture and socio-economic profile of a new customer in order to better match the customer with the most suitable agent and product campaign. This new strategy will have a positive impact that will scale beyond the customer interaction processes of contact services, enhancing security, providing feedback based on cognitive parameters (what is expressed, how it is expressed, what is perceived and how it feels...) and on artificial intelligence, natural language processing and Deep Learning / Machine Learning.

The Konecta Group has:

* An R&D&I strategy based on the optimization of all aspects that accompany contact processes.
* Data, based on the daily relationship of more than 71,000 agents internationally with more than 2 million daily contacts.
* A specific BIG DATA and Modelling company with experts in Data Science as STRATEGY BIG DATA.
* A proprietary S2T model, developed according to the problems of a Contact Center and telematic models.
* A distribution of operation centers in Spain based in Castilla y León where the human capital is distributed.
* A distribution of operation centers in Spain where human capital is distributed.
* A process of attracting resources and a local and international training model.
* The need to systematize learning with new real KPIS.

Additionally, the current situation has allowed:

* Large corporate clients assume teleworking as a reality.
* Homeshoring model is a necessity.
* The user experience in the contact is a variable with as much weight as the efficiency of the process.
* SBD, bases OMD's marketing strategy on:
	+ The sale of new Language optimization services based on artificial intelligence, natural language processing, Deep Learning / Machine Learning and all the aspects that accompany the contact processes.
	+ A huge database, based on more than 55 million conversations per year, in Spanish with different accents and dialects.
	+ Modelling with Data Science experts in voice processing.

Based on the business strategy described above, and taking into account the discussions held with the members of the consortium, a preliminary analysis of the exploitation of results has been carried out. Both the initial business model proposal and the estimates will have to be updated during project execution. SBD proposes a sales model for contact process optimization services. OMD's services are also applicable to corporate clients and users of contact and telemarketing solutions in general.

***Market / competitors***:

Strategy Big Data S.L. frames OMD's results in the field of contact services, Telemarketing and Big Data. It is increasingly difficult for companies to differentiate themselves. Therefore, they must offer remarkable experiences to customers, leaving a positive memory. In this sense, the Call Center can be a support for business success.

The key factor is to have the necessary technology to offer a unique customer experience, meet their needs and expectations to create a bond. Many companies invest in the Call Centers to maintain the relationship with the customer, launch campaigns, sell products, answer questions and conduct opinion surveys.

Technology companies

In general, the service used by the sector is based on the helpdesk style. It has, in general, the function of providing solutions to technical problems that the customer may have. It has different levels of service.

Financial Institutions

Banks, insurance companies and credit card companies also use call center services to maintain customer relationships. The call center also becomes an alternative, new sales channel for offering investment and financing products. It also ends up facilitating the fulfillment of the objectives of professionals, who do not need to move from their work environment to conduct a negotiation.

Product sales and convergence

In addition to traditional product sales (telemarketing), providers (i.e. cable TV, Internet and telephone channels...) use the Call Center to offer products to customers and increase their chances of sales. It is based on customer prospecting, satisfaction surveys and product sales.

The contact center sector is undergoing a major change in the way it operates.

Until now, the massive incorporation of resources, manual call validation processes and/or the implementation of automation (IVRS) that flattened the demand curve sought to bring quality and profitability to the service.

The increase in process capabilities and the emergence of Machine Learning techniques has enabled a change in this model where Big Data and Inference processes allow a proactive exploitation of the customer relationship.

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| **4. Consumer Electronics Targeted Business Impact** |

***Short description***: As consumers learning and working from home, consumer electronics sales grown faster. Türkiye is the Largest TV & white goods producer in the European Market: $40 bn (CAGR: 6.5%) Export: $21 bn. To grow revenue in the domain, business analytics need insights about consumers feedback and intent after sales. There is a gap between sales and after sales customer problems for data flow because of complexity of processes on after sales support platforms or contacting call centers. According to the Turkish Call Centers Association, call centers industry had a value of TRY 5.1 billion and employed 91,000 people in all the call centers throughout the country in 2017, up from the 2013 figures of TRY 2.9 billion and 70,200 employees. The call center sector has set an ambitious target of having a work force of 300,000 people by 2023. Smartfix in OMD project aims to prioritise data governance and collecting accurate data to unlock deeper insights and more cohesive decision making. Also to tolerate the complexity and make activities smart, using artificial intelligence is a must at work and in our private lives. Smartfix will deliver practical actions to produce immediate business impact powered by AI. Such as shortening problem identification and suggesting solutions will reduce the number of tickets and requests to call centers. In addition, 60% of the records coming to the Call Center are simple problems. Solving these problems through the call center creates a huge time and cost loss.

OMD API can be applied to several software as an add-on in all channels in the customer service area. Such as customer support web pages, call center, solution center offices.

Such a solution was not encountered in practice on the customer support web pages of large-scale consumer electronics companies. So the targeted business impact of OMD brings a total change to current solutions for all companies in the domain.

***Main contributors***: DOGUS

***Market / competitors***:

In the competitive landscape, entities like Qudini, ServiceHub by HubSpot, and Qless stand out for their innovative approaches to managing customer interactions and enhancing service efficiency. Additionally, major consumer electronics companies are also heavily investing in research and development to advance their capabilities in this area. These competitors are distinguished by their commitment to leveraging technology to streamline customer service processes, demonstrating a shared recognition of the importance of integrating advanced solutions to meet evolving consumer needs.

* 1. Top 4 overall project KPIs

|  |  |  |  |
| --- | --- | --- | --- |
|  | Initial value | Targeted value | Current value |
| **1. Assignment duration** | 15 mins. | 5 mins. | 13 mins. |

Reducing the assignment duration will be an important key benefit in terms of increasing customer satisfaction and increasing organisational productivity.

|  |  |  |  |
| --- | --- | --- | --- |
| **2. Sales Per Hour (SPH)** | 0,7 | 0,72 | 0,74 |

SPH is calculated by dividing the total sales by the total labour hours worked per a worker. A higher sales per labour hour number indicates that the business is more efficient in using its labour resources, which can lead to higher profits. At the end of the project, we expect a 0,04 SPH increase. That means 1 sales more per week per agent. Konecta Group (SBD belongs to Koneta Group) has over 130.000 sale agents around the wold. This increase will made 600.000 sales more per month in the group.

|  |  |  |  |
| --- | --- | --- | --- |
| **3. SLA Compliance** | %85 | %95 | %91,5 |

This KPI measures the ticket routing success of our general model, which is formed by combining three sub-models with our user experiences. We aim to measure this target with the number of tickets resolved within SLA time constraints.

|  |  |  |  |
| --- | --- | --- | --- |
| **4. Average time-to-fix reduction of software maintenance tasks (by 20%)** | 38.2 days | 30.5 days | N/A |

We’ve chosen one of our long running internal projects as the subject of our OSMTA use case. In this project, the average time between opening and closing a task (e.g. fixing a bug or adjusting a feature) was 38.2 days. As model experiments and refinement reached the state that is worth experimenting with by the end of 2023, we do not yet have statistical data with using the models. By the nature of the KPI and the SW maintenance tasks we handle, it is not possible to use old tasks and recreate KPI values using the models - we simply cannot re-create the same circumstances for each task (load of developers, other tasks in the queue, dependencies, etc.), thus cannot re-measure the time-to-fix values reliably and comparably. KPI measurement with the platform will be run in 2024.

* 1. Top 4 overall risks

|  |  |  |  |
| --- | --- | --- | --- |
|  | Severity | Probability | Stage |
| **1.** Technological Breakthrough Not Achieved | High | Possible | Monitoring & Controlling |

***Avoidance action***:

Continuously monitoring of the project progress and allocating resources effectively to support research and development efforts. Regularly tracking the project's technological development and allocating resources appropriately will help ensure that the project stays on track. It allows for early identification of potential issues and provides the opportunity to make necessary adjustments to the research and development processes.

***Back-up / Mitigation plan***:

Developing contingency plans to adapt project goals and objectives if the technological breakthrough is not fully achieved. Despite careful monitoring and resource allocation, there may still be circumstances that prevent the project from achieving its intended technological breakthrough. In such cases, having predefined contingency plans in place allows the project team to pivot, adjust objectives, or explore alternative approaches to still meet project goals.

***A period in which the risk is relevant***

Throughout the project, with a critical review at the end to assess progress.

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| **2.** Key Partner Withdrawal | High | Possible | Monitoring & Controlling |

***Avoidance action***:

Maintaining strong communication and collaboration with key partners throughout the project. Consistent and open communication is the foundation of a successful partnership. By fostering a collaborative environment and ensuring that all partners are well-informed and engaged, the risk of a key partner withdrawing can be reduced. Regular meetings, progress updates, and shared decision-making contribute to partner satisfaction and commitment to the project.

***Back-up / Mitigation plan***:

Developing contingency plans to address the departure of a key partner, including redistributing responsibilities or seeking alternative partners if necessary. Despite best efforts, unforeseen circumstances may lead to a key partner's withdrawal. To mitigate the critical impact of such a situation, the project OMD team proactively prepare contingency plans. These plans involve reassigning tasks and responsibilities originally handled by the departing partner to remaining collaborators. Additionally, we are considering identifying potential replacement partners in advance to minimize disruptions.

***A period in which the risk is relevant***

Throughout the project, with regular partner assessments. Partner relationships require ongoing management and attention. Monitoring partner engagement, satisfaction, and commitment should occur throughout the entire project duration. By regularly assessing partner dynamics and addressing issues promptly, the project team can proactively reduce the probability of a key partner withdrawal and be prepared to implement mitigation strategies if necessary.

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| **3.** API related risks | Critical | Possible | Monitoring & Controlling |

***Avoidance action***:

1. APIs may not be standard, use-case models or the gateway may lack standardization

Microservices will make it easy for multi-domain OMD teams to work in parallel. We focus on use-cases for feature engineering, and they use a standardised way to share data (MQTT, etc.)

2. API integration in the OMD project introduces significant risks, such as data leaks, unauthorized access, and security vulnerabilities. Here’s a brief overview of how to manage these risks:

* Monitor Access and Set Limits: Keep track of how much a user or API key accesses to prevent overuse and potential misuse.
* Implement Comprehensive Logging: Have a system to log API requests and link them to users, aiding in the detection of suspicious activities.

***Back-up / Mitigation plan***:

The consortium aims to generate a set of flexible APIs - reference patterns - that allow easy connection and disconnection of services.

To mitigate security risks;

* Enforce API Key Usage: Require a valid API key for all web application accesses, rejecting any request without one.
* Regularly Test Security: Use tools to check SSL implementations and improve security measures.

***A period in which the risk is relevant***

Until the end of the project.

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| **4.** Product related risks of integration | High | Possible | Monitoring & Controlling |

***Avoidance action***:

Creating API Gateway between use case applications may not work for all use-cases, such as those exiting the project, having GDPR issues or servicing public institutions and they may keep their product as an in-house application.

For avoidance, various technical workshops will be organised with the consortium members, and we shall choose a course of action.

***Back-up / Mitigation plan***:

Exclusive use-cases partake in the common platform through exploitation activities. Connecting only those models which have standardisation and API provided.

***A period in which the risk is relevant***

Until the end of the project.

* 1. Change in the technology and market during the reporting period

There are many developments concerning the service desk management, especially in the ITSM domain as large industries and smaller ones have obviously had their patents issued, most of which were granted in this period.

The last six months of 2023 saw significant advancements in large language model (LLM) artificial intelligence technologies. Here's a summary of the key developments:

1. \*\*Increased Model Sizes and Efficiency\*\*: There was a noticeable trend towards developing even larger models, with some surpassing the trillion-parameter mark. These models demonstrated improved understanding and generation capabilities across diverse languages and contexts. Concurrently, there were significant strides in making these models more efficient, reducing their environmental impact, and making them more accessible for real-time applications.

2. \*\*Enhanced Multimodal Capabilities\*\*: Progress in multimodal models, which can process and generate text, images, audio, and video, was particularly notable. These models have become more sophisticated, offering more accurate interpretations of complex inputs and generating more detailed and contextually relevant outputs.

3. \*\*Better Handling of Context and Nuance\*\*: Advances in understanding context and nuance allowed LLMs to provide more accurate and nuanced responses. Improvements in handling ambiguous queries and recognizing the subtleties of human language have made interactions with these models more natural and effective.

4. \*\*Customization and Specialization\*\*: There was a move towards customizable and specialised models tailored for specific industries or tasks, such as legal analysis, medical diagnostics, and creative writing. These specialised models offer improved performance by leveraging domain-specific knowledge and datasets.

5. \*\*Ethics and Bias Mitigation\*\*: The latter part of the year also saw a heightened focus on ethical considerations and bias mitigation in LLMs. Research and development efforts aimed at creating more transparent, fair, and accountable models were evident, with new frameworks and tools introduced to evaluate and reduce biases in AI systems.

6. \*\*Interactive Learning and Adaptability\*\*: Another area of innovation was in interactive learning and adaptability, where models can learn from user interactions and feedback in real-time. This has led to more personalised and adaptive learning experiences, enabling models to better understand individual user preferences and needs.

7. \*\*Robustness and Security\*\*: Enhancements in the robustness and security of LLMs were also a priority, with efforts to protect against adversarial attacks and ensure the integrity of model outputs. These advancements are crucial for the deployment of AI in sensitive and critical applications.

8. \*\*Global Collaboration and Open Source Initiatives\*\*: The period was marked by increased global collaboration and open-source initiatives, aiming to democratise access to cutting-edge AI technologies. Partnerships between academia, industry, and governments flourished, fostering innovation and addressing global challenges through AI.

These developments reflect the dynamic and rapidly evolving field of AI, with large language models at the forefront of transforming how we interact with technology and data. As we move forward, the focus on ethical AI, user-centric design, and cross-disciplinary collaboration is likely to shape the future trajectory of these technologies.

GDPR Impact on processing

RGPD focuses on maintaining business transparency, expands consumer privacy rights, and applies to all EU citizens, regardless of the location of the company collecting the data. It also regulates how companies export personal data outside the EU, requiring companies and organizations with large-scale data processing and data subject tracking to have a data protection officer (DPO), with the DPO being responsible for data governance and compliance.

Companies that fail to comply with the GDPR rules face legal consequences, such as a fine of €20 million or 4% of their annual global revenue, whichever is higher. In addition, the DPO ensures that appropriate data protection principles are applied to keep personal data secure. It also identifies the reasons for collecting personal data and specifies that it must be for a particular, legitimate purpose, and organizations may not use it beyond that intent. The regulation aims to place limits on how much data organizations and companies can collect. It stipulates that data collection is limited to what is necessary for the purposes for which an organization processes and uses the data.

In addition, the GDPR states that organizations that collect data must ensure its accuracy and update it when necessary. Data controllers must obtain authorization to transfer personal data to an international organization or to another country.

Finally, it should be noted that the GDPR imposes the same responsibility on processors and data controllers. It means that a non-compliant third-party processor affects an organization's compliance status. The law also has strict requirements for reporting breaches up the chain. All information processed in this project contains the authorization of its owners to that effect. The developments undertaken are based on strict compliance with current legislation.

Contact Center Market Issues

According to the latest Market Study on the situation of the Contact Center, published by the CEX Association, in 2022, despite the increase in permanent contracts and stability, the sector continues to raise its absenteeism ratios reaching 12.48%, a truly alarming figure, doubling the average rate of the service sector in Spain (6.2%), as well as the % of turnover which has also increased compared to 2021 and stands at 7% theoretical, reaching 25%-35% in some projects. If we zoom in, we see that 43% of the loss of personnel is voluntary (compared to 47% in the previous year) and 57% involuntary (compared to 53%):

 This implies Low Profitability of the Project, apart from multiplying the inherent costs to combat this type of circumstances by extending the recruitment process, training, and salary, 25% - 35% of the costs incurred are thrown away. Likewise, the Quality-of-Service Level deteriorates rapidly, resulting in increased management, team attrition and financial penalties from the client contracting the service.

The bargaining power of large customers, the extensive use of manpower, the emergence of new self-service channels (which limit the number of calls), the reduction of calls by type of product (e.g. convergent tariffs), or technologies that reduce technical complaints (e.g. fiber), are leading the contact center sector to a process of sectorial consolidation through large mergers/acquisitions. This is the case of Konecta, which merged in 2022 with COMDATA, this being one of several corporate movements that are being developed at international level.

 While it is true that, throughout the year 2022, the number of calls to customer care services suffered a considerable increase (6%), mainly in the telecommunications sector, the sector with the highest demand in Spain...

 Today the number of calls from users in contact centers are at historic lows; users use other channels, many of them automated, with a trend that extends to most sectors, telco, energy, banking, etc... A clear example is the average number of customer complaints in the telco sector, which barely reaches 1%, while complaints about invoices are at 0.25%.

At the same time, large contractors are pushing for economic models based on service and resolution or sales rather than on the number of calls, which has an impact on the cost structure. The need for strong technological investment to be able to compete and for a compliance model in line with top-level clients complete this particular problem of the sector.

 It is noteworthy the decrease in investment in the field of Conventional AI by 18 percentage points in 2022 compared to 2021 (companies that make up the CEX association) although it is true that the sector in 2023 is in a process of expectation in the application of Generative AI and in particular of LLM.

As a result of all this, we have a very significant situation: Teleperformance, the number one in the sector, accumulated a drop of 45% on the stock market in 2023. The company, which lowered its annual forecasts, has been downgraded by Goldman Sachs due to limited revenue visibility.

1. Market access & Exploitation
	1. Partners’ market access

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| Strategy Big Data | ind | ESP | 13 PY |

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| Big Strategy data is currently part of ROCKETHALL Group. ROCKETHALL Group has a vast network of customers in Spain and LATAM, with presence in several countries such Colombia, Mexico and Peru.
 Strategy Big data will integrate the project results to advance its portfolio of highly innovative, added-value niche services on AI, ML and NLP techniques. Strategy Big Data estimates that the new emerging opportunities will impact in the company with an expected employment growth, as a result of the project, of 8%, and an impact on annual turnover of 9%. A positive ROI is estimated to be achieved within 18 months of commercial exploitation. |

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| Caretronic d.o.o. | sme | SVN | 11 PY |

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| RT is planning to communicate OMD project results on several scales:
Internal dissemination acitivities: Inside the company ERT will communicate activites of the project regulary
through e-mails and on a monthly basis at general company meetings. ERT will hold also task-specific
meetings with project team working on OMD project on weekly basis or whenever required.
On home-market (Slovenia) ERT has many customers (nursing homes, health-care facilities, care
organisations with primary and secondary end-userse as well as market-players) where we will promote the
system directly with personal visits and e-mail newsletters. ERT also organises business events for
presentation of novelties to existing and potential new customers from Slovenia where also OMD solution
will be presented. ERT will also publish OMD solution on their company's website.
On international markets (EU and outside EU – Turkey, Israel, Middle East, New Zealand, Brasil, Latin
America ...) ERT will present solution on exh |

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| Instituto Superior de Engenharia do Porto (ISEP) | uni | PRT | 9 PY |

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| As a research center that works closely to a diversity of companies and associations, ISEP-GECAD will develop, promote, install, and undertake the maintenance of the results of this project. More in detail, ISEP-GECAD expects to develop new recommendation and search services and applications to help customers search products in web stores. Also, we will contribute to the project dissemination actions such as marketing leaflets, press releases and results presentation in conferences, journals, seminars or other events as a writer or a co-writer, as organizer or a participant. |

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| ARD GROUP | ind | TUR | 6 PY |

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| EqualityInJustice use case will enable enterprise licencing for Government Authorities including Ministry of Justice, General Directorate of Police and Union of Turkish Bar Associations. The EqualityInJustice Cloud Application is planned to be licenced for the Unuion of Turkish Bar Associations and end user licencing model will be provided for the attorneys who will participate in assignments to counsel. There are 160.651 attorneys registered to the union as of December 2021. End users (attorneys, law enforcement personnel and Ministry of Jusitce personnel) will be connecting the EqualityInJustice Cloud Application via the web application and mobile application which will provide flexibility of usage. Furthermore this business model will be targeted for other countries. |

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| Experteam | sme | TUR | 6 PY |

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| The solution to be developed in this project is primarily for our own use to reduce costs internally. It will attract also the attention of of our contacts who switch to the remote working model due to pandemics and wish to reduce their operation costs. The ITSM market data is as below:
 "Study Period: 2018 - 2028
Market Size (2023)=USD 4.77 Billion
Market Size (2028)=USD 5.35 Billion
CAGR (2023 - 2028)=2.33 %
Fastest Growing Market: Asia Pacific
Largest Market: North America Major Companies: IBM, Atlassian, BMC, CISCO, Rocket Software, Micro Focus" |

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| FTP - Com. Equip. Inf. Lda | sme | PRT | 6 PY |

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| Over the past few years, e-commerce has become a key part of selling physical, digital, and service products. Thanks to the constant evolution of the Internet, its growth has been constant from year to year and the projections also point to the continuation of this increase. In 2021 it reached 5 billion dollars in sales and the estimate for 2026 is 8 billion dollars.
From the technological point of view, several tools and technologies have also evolved to make e-commerce more accessible. This accessibility applies not only to the consumer who makes his purchases but also to those who sell since several platforms and services facilitate operationalizing the entire process. However, many custom-developed systems still allow for complete customization, but at the cost of greater complexity during development.
E-commerce will be the target of constant investment and technological evolution, because of its growing adoption and practical use.
We focus on developing a recommended system t |

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| DOGUŞ BILGI ISLEM VE TEKNOLOJI HİZMETLERİ | ind | TUR | 4 PY |

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| With a dedicated team of researchers Dogus Technology is working on NLP and machine learning technologies to develop digital assistants to solve/meet customer problems/demands. Dogus Technology provide NLP services to Dogus Group companies and outside customers. With the result of this project, Dogus Technology targets its existing partner, Samsung. Our customers and group companies that we work with for customer support with our other products (agent panel, Chatbots of support, sales, service appointment) may be our first potential customers. In other sectors where product after-sales support is provided, for example, food, clothing, technology can be used. First of all, local customers will be targeted specifically in Turkish. Subsequently, international sales can be targeted for customers with their own data in different languages. |

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| Hiperlink Eğitim İletişim Yayıncılık Gıda San. Paz. ve TIC. LTD. STI. | sme | TUR | 4 PY |

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| We will use the product that will come out as a result of the project as a priority in the products we have developed, to direct the errors we caught from the trace logs to the correct team and to show the correct error messages to the user. In addition, we will work effectively in projects such as licensing this product in departments such as universities, university libraries, and municipalities in terms of marketing and sales. We have studies on universities that provide American Turcology education abroad. Currently, 4 universities in America are using our products. We are planning marketing activities for our own products in the next year as the European Union countries and the UK.  |

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| BEIA GmbH | sme | AUT | 3 PY |

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| BEIA already supplies big data and speech processing solutions to various customers in Romania (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 partners network. BEIA had several presentations of the solutions advanced within the project objectives, focusing on RPA for tenders.
We proposed to expand the targeted companies from other fields that have support operations and logistics, not only from the field of industrial production.
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| FrontEndART Software Ltd. | sme | HUN | 3 PY |

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| By integrating the results of the project into FrontEndART's source code quality management system, all the users will benefit from the project's outcome. First, the internal development of FrontEndART's services will be enhanced, improving the reputation of the company and its services. Second, the developed functionality will be offered to FrontEndART's customers as a separate service or as an extension of the existing services. The increased service quality and the savings realized at our customers will probably convince them to accept the slightly increased license prices. We primarily focus on the Hungarian market, aiming our current customers and planning to contract with new companies. We made a market analysis of the German and UK market too, which are our next targets. Furthermore, provided that we'll continuously analyze a large number of open source software systems, the tool will be able to generate maintenance tasks for the community members automatically in an optimal way |

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| University of Szeged | uni | HUN | 2 PY |

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| USZ collaborates with many prominent industrial partners and research organizations worldwide, ensuring its leading position on the list of higher education institutions in Hungary according to the QS World University Rankings of 2022. As Healthcare and Health Sciences are essential parts of USZ, it will be possible to directly evaluate and use the relevant project output in a real working healthcare environment. The innovative solutions and knowledge output, on one hand, are great opportunities for USZ to strengthen its R&D activities, encouraging new collaborations and future projects. On the other hand, being a higher educational institute, USZ can also take part in various teaching activities, and help its students or the project output’s end users gain high quality, state-of-the art knowledge of a modern and innovative new technology. Furthermore, this knowledge introduced by developing new AI/ML and NLP methods during the project can be transferred to other projects and products  |

* 1. Top 8 cumulative project achievements

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| 1 | Exploitation | New product | Reference Architecture for Multi-domain assignment tool | 1 |

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| Summary | The tool shall be able to combine data from different sources across multiple domains. It shall generate assignments based on the selected domain information and platform. Such a tool will be particularly useful for users who work across multiple domains, as they will be able to create assignments based on data obtained from various domains. |
| Impact | The described tool can bring significant benefits to the companies, such as increased efficiency, improved customer satisfaction, competitive advantage, and potential for expansion. (quantification: 8) |
| Partners | Experteam, Hiperlink Eğitim İletişim Yayıncılık Gıda San. Paz. ve TIC. LTD. STI., DOGUŞ BILGI ISLEM VE TEKNOLOJI HİZMETLERİ, ARD GROUP |

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| 2 | Exploitation | New product | AI/ML models scaled effectively for improved performance and efficiency. | 1 |

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| Summary | The proposed approach involves agents and user preferences to assign tickets based on related goals in different use cases. |
| Impact | Develop and Improvement new models (quantification: 0) |
| Partners | Experteam, Hiperlink Eğitim İletişim Yayıncılık Gıda San. Paz. ve TIC. LTD. STI., DOGUŞ BILGI ISLEM VE TEKNOLOJI HİZMETLERİ, ARD GROUP |

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| 3 | Exploitation | New standard | Alpha version of purchase propensity models. | 1 |

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| Summary | This application takes information about potential buyers from a database and tries to predict their propensity to make a purchase. The model is trained based on past behavior of buyers and takes in account their past interactions.
The model’s input comprises three data sources:
- Client’s information: Adress, Sex, etc.
- Client’s past purchases
- Past calls to the clients |
| Impact | Mejorar estrategia de ventas (quantification: 0) |
| Partners | Strategy Big Data |

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| 4 | Exploitation | New standard |  Research of purchase prediction methodologies | 1 |

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| Summary | State of the art studies and analysis of the different existing technologies associated to:
- Techniques and methodologies associated to purchase probability prediction.
- Techniques and methodologies associated to the generation of socio-cultural profile of potential customers.
- Techniques and methodologies associated with the prediction of rapport and mood. |
| Impact | Improving sales strategy, % (quantification: 5) |
| Partners | Strategy Big Data |

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| 5 | Dissemination | Conference | Footwear E-commerce chatbot System architecture | 2 |

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| Summary | In this paper we describe the system Architecture that we are proposing to the Footwear E-commerce use case |
| Impact |  (quantification: Confidential) |
| Partners | Instituto Superior de Engenharia do Porto (ISEP) |

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| 6 | Dissemination | Workshop | Architecture and Optimization problem agreement | 2 |

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| Summary | We made workshops for architecture and the optimization problem for the whole consortium to agree on one general scheme that involves all.
As a result we distributed and collected templates of individual use-case architectures in a more unified framework. Each use-case was then analysed and a synthesis was generated as the second high-level architecture.
Concerning the optimization problem we will distinguish the use-cases that will need additional optimization solution on top of their individual AI design. |
| Impact | 1 optimization partner and 8 use-case owners are involved in this one, led by Doğus, Hiperlink and Experteam (quantification: 9) |
| Partners | Experteam, Hiperlink Eğitim İletişim Yayıncılık Gıda San. Paz. ve TIC. LTD. STI., DOGUŞ BILGI ISLEM VE TEKNOLOJI HİZMETLERİ |

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| 7 | Exploitation | New service | Agent and product matching system for marketing | 2 |

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| Summary | In OMD, SBD will provide new mechanisms to improve the profiling of demographic and geo-referenced data sets with potential customers. |
| Impact | New models will be generated to infer mood and socio-economic status of customers and agents, and to predict affinity (relationship, socio-economic status) (quantification: 0) |
| Partners | Strategy Big Data |

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| 8 | Exploitation | New product | Optimal Software Maintenance Task Assignment module | 2 |

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| Summary | Based on the AI model developed for Optimal Software Maintenance Task Assignment, an OMD software module will be implemented (either as a library or a deployable subsystem). |
| Impact | The module will enable the integration of Optimal Software Maintenance Task Assignment feature into the management systems of the FrontEndART. (quantification: 100) |
| Partners | FrontEndART Software Ltd. |

* 1. Realised achievements

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| Dissemination | Exploitation | Standardisation | New company | Patent | Human capital |
| Total: 9 | Total: 22 | Total: 0 | Total: 0 | Total: 0 | Total: 0 |

1. Project progress during the reporting period
	1. Project progress and issues during the reporting period
		1. Top 4 technical achievements during the reporting period

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| **1. Information Enrichment** |

Classifying a customer involves using all the information available for this purpose in the company's systems. Generally this data corresponds to data collected from operations based on previous contacts and their results.

Developing an affinity model implies going further and adding new variables that provide a new perspective on the customer. We are talking about the application of:NLP models, based on sentiment and the impact this has on the conversation, if we have had previous contact.

Extraction of additional potentially usable information that is publicly available. Given the existing data protection limitations, it is as important to know which sources are accessible as those that are not.

- Identification of key sources

- Information Extraction . Methods and Processes Availability and Variability of the same.

- Compliance with the RGPD policy. Acceptance of customer use.

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| **2. AI models design and optimization** |

We already had a framework to collect/extract various information about the code.As part of the OMD project, this was extended with additional data collection modules (Redmine - issues, text, dates, timings, …; GitLab - issues, developers, source code, their relations, …).OSMTA modules are integrated into FrontEndART’s issue handling system.Several versions of AI models, trained on FrontEndART’s own development project

Integrate the use of the modules into our processes, we designed and started to implement how our solution will integrate into the global OMD platform.

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| **3. Data Analysis** |

In the period we mostly worked on data analysis and AI model development and also initiated a data annotation project. Dogus has successfully developed an AI model that outperforms baseline models in terms of efficiency and effectiveness. Technically this is a multilabel classification model for issues used pretrained models and finetuning. For named entity recognition,

an autocorrection method using TRIE structures was determined using "Autocorrect" + BM25 together, the API is being developed with Samsung device models.

We continue for further enhancements and improvements on the model's performance. We initialized an annotation project for labelling out test data which we crawled over online platforms.

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| **4. Agent-Client Match System** |

Once the agent-customer classification has been arranged, it is necessary to proceed to the assignment of the best pairs between them. This arrangement cannot alter the response times of the service as it would result in penalties and loss of service.

We must take into account the increasingly frequent unforeseen events in the hiring environment, absenteeism, staff turnover, campaign changes, etc.

It is also important that the model does not generate an overexposure on the best agents that ends up causing a high level of turnover due to lack of opportunities.

- Classification of Grouped Typology of Agents.

- It will be essential to monitor the model.

- Agent Disposition. Limitations due to cancellations, changes, absenteeism, etc. Response times of the production process.

 The dynamism of the market can cause a serious distortion that conditions its association capacity. To this end, a control dashboard must be set up.

* + 1. Top 4 next technical targets

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| **1. AI-Model Development** |

Designing an artificial intelligence (AI) model involves several key steps, from problem definition and data collection to model selection, training, and evaluation. In our project we will continue AI model design based on best practices which are described below.

* Model Training
* Model Evaluation
* Fine-tuning and Optimization
* Deployment and Monitoring

In the forthcoming period, where the partners are targeting the integration of AI models into products, the optimization of models for production run is planned.

Dogus Technology is proceeding well with the following steps:

* (evaluation) Initiate an annotation study to evaluate NLP model efficacy in handling consumer electronics complaints using labelled data from sikayetvar.com, an online platform that collects customer issues. This research aims to refine AI customer service tools by analysing real-world feedback for more accurate and user-focused responses.
* (exploration) Conduct research aimed at exploring the integration of reinforced learning with human feedback mechanisms in artificial intelligence (AI) systems.

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| **2. Classification** |

Classification models are mainly for demand prioritisation. Our target is to determine with high accuracy the importance level of a ticket that comes to the system for the first time. For this reason, we aim to increase the accuracy in the assignment of these tickets. The agent assignment task is also a classification problem, where accuracy can be increased with further optimization. This involves fine tuning or complete re-training of the models with newly available data. Minor modifications to AI models, such as feature space expansion, data processing, or integration-related modifications are planned for the forthcoming period.

Dogus Technology embarked on a research initiative to enhance multilabel classification techniques, addressing the complexity of customer complaints that often encompass multiple issues. This study aims to refine AI models to accurately identify and categorise the diverse range of problems presented in a single complaint, improving response efficiency and effectiveness.

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| **3. API Development** |

Partners are targeting the full integration of AI modules to their individual products. API development to access the newly developed services through the common OMD platform is also a technical target for the next period.

The consumer electronics use-case implements an on-demand model file I/O loading system, coupled with the development of a consumer layer that queues request, maintains them in memory, and incorporates multiple security layers. Additionally, the deployment of the application to the server and the definition of DevOps processes are planned. This approach is designed to streamline operations, enhance security measures, and improve overall system efficiency through optimised resource management and automated deployment practices.

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| **4. Performance Assessment / KPIs** |

An assessment will follow our development activities. The current values are being determined in this period and the assessment of the assignment success is a main technical target for the next period. In this report we present the target and the current values for all use-cases.

* + 1. Top 4 issues

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| **1. Data quality of raw data / Data acquisition** |

***Details***:

Data quality issues stem from inconsistencies, inaccuracies, incomplete or repetitive data sets, and the lack of standardisation across data from different partners and domains. These issues complicate the process of data acquisition, integration, and analysis, leading to difficulties in training the AI models effectively.

***Impact***:

Poor data quality directly affects the accuracy and reliability of the AI-driven forecasts and recommendations produced by the software. Inaccurate or incomplete data can lead to reducing of KPI’s goals of optimising ticket management. Additionally, significant time and resources expended in attempting to clean, standardise, and integrate flawed data sets, delaying project progress and causing increased costs.

***Mitigation action***:

The project teams implemented automated tools and processes for validation, cleansing, deduplication, and standardisation of incoming data. Additionally, explore and adopt data acquisition methodologies, such as web scraping, API integrations (ChatGPT etc.), and the use of alternative data sources to enrich and validate partner data.

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| **2. Resource issues** |

***Details***:

Challenges in securing sufficient skilled personnel, computational resources, and budget constraints impact project timelines and development quality.

***Impact***:

Resource constraints lead to delays, reduced innovation, and potential compromises in software features and performance.

***Mitigation action***:

Prioritize critical project areas, seek additional funding, optimise resource allocation, and explore partnerships for resource sharing and expertise exchange.

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| **3. Propensity model issues** |

***Details***:

Difficulties in developing accurate propensity models due to variable data quality, complexity of customer behaviours, and evolving market conditions.

***Impact***:

Inaccurate models may lead to ineffective targeting and forecasting, affecting customer engagement, sales strategies, and revenue potential.

***Mitigation action***:

Enhanced data collection, applied advanced analytical techniques, continuously refine models based on new data insights, and engage domain experts for annotation and validation.

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| **4. Team member turnover** |

***Details***:

Frequent changes in team composition disrupt project continuity, knowledge transfer, and morale, impacting productivity and timelines.

***Impact***:

Turnover leads to project delays, increased training costs, and loss of institutional knowledge, potentially compromising project quality.

***Mitigation action***:

Tried to improve retention through career development opportunities, and a supportive work environment; streamline onboarding for new hires.

* + 1. Status of deliverables

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| **[Planned] What is the total number of deliverables in the project?**  |

There are twenty-four deliverables defined in the overall project.

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| **[Planned] How many deliverables are supposed to be finalised (from the start of the project until the end of this reporting period)?** |

The following deliverables below were supposed to be finalised.

|  |  |
| --- | --- |
| D1.1 - Project Progress Report - PPR1 | Jun 2022 |
| D2.1 - State-of-the-art Analysis | Jun 2022 |
| D2.2 - Scenarios and Use cases | Jun 2022 |
| D2.3 - Legal, ethical and Acceptance analysis | Sep 2022 |
| D2.4 - Requirement analysis | Sep 2022 |
| D3.1 - General system architecture | Dec 2022 |
| D1.2 - Project Progress Report - PPR2 | Dec 2022 |
| D1.3 - Project Progress Report - PPR3 | Jun 2023 |
| D1.4 - Project Progress Report - PPR4 | Dec 2023 |

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| **[Actual] How many deliverables have already been finalised (from the start of the project until the end of this reporting period)?** |

We finalised the following nine deliverables.

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| D1.1 - Project Progress Report - PPR1 | Jun 2022 |
| D2.1 - State-of-the-art Analysis | Jun 2022 |
| D2.2 - Scenarios and Use cases | Jun 2022 |
| D2.3 - Legal, ethical and Acceptance analysis | Sep 2022 |
| D2.4 - Requirement analysis | Sep 2022 |
| D3.1 - General system architecture | Dec 2022 |
| D1.2 - Project Progress Report - PPR2 | Dec 2022 |
| D1.3 - Project Progress Report - PPR3 | Jun 2023 |
| D1.4 - Project Progress Report - PPR4 | Dec 2023 |

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| **[Delayed] Are there any deliverables delayed more than 2 months in this reporting period? If so, please explain why.** |

There are no delayed deliverables.

* + 1. Statement on project progress during the reporting period

In this period, Project works are conducted well-structured with project committees. We have done technical monitoring workshops, architectural discussions, management activities, deliverable documents initiation and coordination with partners. The CR is submitted and approved by ITEA. Representation activities (i.e. disseminations, publications, events etc.) have been carried out by partners.

With the leaving partners we realigned the consortium and two work packages. With the new role distribution, we shall do better time and scope management, thereby finishing the project in a timely manner. Integration was conclusively discussed, and a firm intention set on the presentation of the demos. For the latter, we gave it a first trial during our StG review.

Four out of seven milestones are almost achieved. WP1 is 60% complete, with four reports on the national and international side. WP2 is %100 complete, with the last period of the project. WP3 has progressed 75%. WP4 is 33% complete, and WP5 has progressed 20%. WP6 has reached 60% complete, with 15 publications and exploitation.

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| ID | Description | Month of completion |
| MS1 | Specification of use cases, State-of-the-art Analysis.Deliverable D2.1, D2.2 are released. | M6 |
| MS2 | Definition of requirements.Deliverable D2.3, D2.4 are released. | M9 |
| MS3 | Definition of general system architecture.Deliverable D3.1 is released | M12 |
| MS4 | Specification of evaluation metrics.Deliverable 5.1 is released.  | M28 |
| MS5 | System Architecture Design and AI Models Development, System Development and Integration, Realisation of Use Cases tasks outputs.Deliverable D3.2, D3.3, D3.4, D4.1, D4.3, D5.2 are released. | M30 |
| MS6 | UI and Reporting Interfaces Development, Integration, Test, and Validation tasks outputs. All use cases successfully installed with OMD. Deliverable D4.2, D4.4, D5.3 is released.  | M36 |
| MS7 | OMD Dissemination and exploitation tasks.Deliverable D6.1, D6.2, D6.3 are released. | M36 |

* 1. Details of progress per Work Package

#### WP 1: Project Management

Coordinating both the national and international consortia

Realignment of the consortium

Multi-sectoral representation of the problem

Periodic project reporting activities

Support to Integration and Exploitation

New partner to lead the integration WP

New partner to do the Exploitation work

CR submitted

Risk and scope management

Workshops to redefine the technical scope

Risks caused by insufficient resource allocation: tasks excluded from the project with leaving partners.

Caught-up with the timeline and managed the consortium successfully in the fourth phase, reporting more reliably and in timely manner.

#### WP 2: Use Case Requirements and Business Models

WP2 was completed in June 2023. The works regarding the outputs of the work package has been uploaded under the work package on the ITEA portal. Additionally, the work related to Action 35, 36, and 40 which are related to WP2, as per the outcome of the 1st STG evaluations, has been presented and closed in the last 2nd STG.

#### WP 3: System Architecture Design and AI Models Development

Please update

#### WP 4: System Development and Integration

Please update

#### WP 5: Demonstration

Work Package 5 commenced its operations in January 2024, embarking on a phase filled with anticipation for advancements. Prior to this launch, we showcased a promising use case from Portugal, effectively laying the groundwork for the extraordinary progress we envision.

In the lead-up to this stage, extensive preparations and strategic planning have been undertaken, heightening the anticipation for WP5 demonstration.

Work Package 5 stands as a vital crossroads in the evolution of our project. Our resolve to achieve excellence remains steadfast, with every initiative we pursue closely aligned with our project's goals and overarching vision. We are confident that through collaborative effort, ingenuity, and unwavering commitment, we will reach significant milestones and, more importantly, enact a substantial and enduring impact.

We recognized the importance of continued support and engagement from all project stakeholders. By working together, we are committed to fulfilling our project's objectives and delivering a demonstration that will not only highlight our collective achievements.

#### WP 6: Dissemination&Exploitation

Please update

* 1. Per partner progress during the reporting period
		1. Partners’ main contribution and effort

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| --- | --- | --- | --- |
| Partner | Planned effort (Project start~ end of reporting period) | Actual effort (Project start ~ end of reporting period) | Contact |
| University of Szeged | 1.48 | 1.95 | László Vidács |

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|  | Main contributions during the reporting period:USZ develops language model-based AI tools to automate the assignment of developers to issue tickets in the Software Development use case. In this period, we finalized the fine-tuning of multimodal machine learning models that uses several data sources to train and use a model for assigining developers to issue tickets. The Knowledge Graph as the central data store was also finalized and several queries were defined for profiling. Contenerization and preparation for integration was also started. |
|  | Discrepancy explanation:The reason of the discrepancy is twofold. On one hand, the task complexity required more experiments already in the previous period, and some extra effort was needed in this period as well, during the deveopment of the multimodal machine learning models. On the other hand, USZ employed master and phd students in this project and the less experienced developers needed more time to finish tasks. |

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| Experteam | 3.62 | 3.62 | Demet Seyhan |

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|  | Main contributions during the reporting period:In this period we went on coordinating the national and international consortium as well as the reporting. We led the StG Review process. We prepared and submitted a CR and reorganized the consortium after changes.
Technically, completion time prediction and ticket prioritization are presented as well as prepared for further programming. The studies on web service development have begun. NLP model development has begun for the next classification algorithm. |

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| ARD GROUP | 3.95 | 3.66 | Arda Ödemiş |

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|  | Main contributions during the reporting period:Under the process of creating and preprocessing datasets, activities involving data collection, cleaning, transformation, and analysis have been conducted. Work on Reference System Architecture has progressed, and joint decisions have been made with consortium partners on what communication elements and components should entail. |
|  | Discrepancy explanation:The actual effort was achieved according to the national funding criteria. There are not relevant discrepancies between the planned effort and the actual one. |

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| Caretronic d.o.o. | 6.00 | 6.00 | Simona Brezar |

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|  | Main contributions during the reporting period:main contributions have been in the areas of research and development, encompassing both software and hardware development. This includes the development of communication platforms, mobile applications, user interfaces, and the integration and development of various sensors. Furthermore, they have played a critical role in the AI domain, contributing to the project's innovative solutions.
Market introduction to care organizations, telecom companies, and leveraging their international  |

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| FrontEndART Software Ltd. | 1.20 | 1.15 | Tibor Bakota |

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|  | Main contributions during the reporting period:The GitLab and Redmine data extraction modules have been enhanced within the framework of the project to meet the identified needs. A market access model for using the OSMTA use case advances has been worked out in this period. |

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| Hiperlink Eğitim İletişim Yayıncılık Gıda San. Paz. ve TIC. LTD. STI. | 2.45 | 2.45 | Hilmi Oğuz |

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|  | Main contributions during the reporting period:Following our recent assumption of the team leadership for WP4 from the Portuguese team, we've initiated a series of steps to streamline the development process within this work package, which focuses on development tasks. Our first action was to establish a dedicated email group for the development teams, enabling us to facilitate communication and coordination efficiently.
 We've embarked on organizing monthly workshops with the development teams, where we've delved into discussions around the |
|  | Discrepancy explanation:there is no discrepancy.  |

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| BEIA GmbH | 1.20 | 1.00 | George Suciu |

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|  | Main contributions during the reporting period:BEIA contributed to the dissemination and exploitation of the use cases |
|  | Discrepancy explanation:BEIA has worked self-funded on best effort basis |

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| DOGUŞ BILGI ISLEM VE TEKNOLOJI HİZMETLERİ | 2.53 | 2.53 | Setenay Gemici |

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|  | Main contributions during the reporting period:Class labels analysed in a dataset, merging lead to 97 final labels. To mitigate class distribution imbalances, the dataset was carefully split, and FastText was chosen for benchmark. Evaluation prioritized the macro F-1 score due to the dataset's imbalance. The model achieved a macro F-1 score of 0.90, prompting further exploration of advanced models on the Huggingface platform. Word correction and BM25 with TRIE structures for fast search and information extraction API developed. |

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| Strategy Big Data | 8.03 | 8.03 | IGOR CASADO MORENO |

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|  | Main contributions during the reporting period:Developing an affinity model implies going further and adding new variables that provide a new perspective on the customer. We are talking about the application of:
NLP models, based on sentiment and the impact this has on the conversation, if we have had previous contact.
we seek to classify an agent in the most optimal way possible without impacting the call assignment process.
We associate customer profiler with the Mood/Cultural/Socioeconomic module.
Assignment of the best pairs . |
|  | Discrepancy explanation:Thre is not a relevant discrepancies |

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| FTP - Com. Equip. Inf. Lda | 6.16 | 6.16 | Germano Fernando Santos Pinto |

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|  | Main contributions during the reporting period:We left the project in June 2023.
Our national funding ended on June 2023 |

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| Instituto Superior de Engenharia do Porto (ISEP) | 8.70 | 8.70 | Goreti Marreiros |

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|  | Main contributions during the reporting period: |

* + 1. Actual vs. planned effort overview

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| Report | Planned effort up to reporting period (PY) - total: 66.03 PY | Reported actual effort up to reporting period (PY) |
| 2023 Semester 2 | 45.32 (69% of total) | 45.25 |
| 2023 Semester 1 | 33.54 (51% of total) | 33.18 |
| 2022 Semester 2 | 19.94 (30% of total) | 23.52 |
| 2022 Semester 1 | 9.06 (14% of total) | 9.37 |

1. Additional feedback to previous STG remarks (optional)

**To STG reviewers**: This chapter is meant to provide additional information on the status of actions, in addition to the information on the online action tool (the information is exported on the Excel file). The project consortium uses this chapter to provide longer and more detailed information that are too exhaustive for online action tool and the Excel export.

Following actions have been commented on and marked as done on the platform.

|  |  |  |  |
| --- | --- | --- | --- |
| **Number** | **Action** | **Status by PL** | **Deadline** |
| ACTION-047 | [Provide more details for the last achievement - as having a workshop is not an achievement and results and conclusions from the workshop are not explained.](https://itea4.org/community/project/action/view/13189.html) | Done | Before the next PPR 2023\_H2 |
| ACTION-048 | [Explain clearly which areas of the project are impacted by LLMs/ChatGPT based solution and which areas were identified to be well served by current project results.](https://itea4.org/community/project/action/view/13190.html) | Done | Before the next PPR 2023\_H2 |
| ACTION-050 | [Clarify the status of Portuguese partners and the impact for the project.](https://itea4.org/community/project/action/view/13192.html) | Done | Before the next PPR 2023\_H2 |
| ACTION-053 | [Next PPR, sort the Project Acronyms alphabetically.](https://itea4.org/community/project/action/view/13195.html) | Done | Before the next PPR 2023\_H2 |
| ACTION-046 | [Next PPR, update the current KPI values.](https://itea4.org/community/project/action/view/13188.html) | Done | Before the next PPR 2023\_H2 |
| ACTION-049 | [Next PPR, make sure that all partners provide input for their main contribution.](https://itea4.org/community/project/action/view/13191.html) | Done | Before the next PPR 2023\_H2 |
| ACTION-052 | [Next PPR, check and update the partners' market access section (how does each partner intend to access its market).](https://itea4.org/community/project/action/view/13194.html) | Done | Before the next PPR 2023\_H2 |
| ACTION-051 | [Address the pending actions.](https://itea4.org/community/project/action/view/13193.html) | Done | Before the next PPR 2023\_H2 |