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Deliverable D8.2

Pilot results of Smart Energy MicroGrid Neighbourhood use-case

Work Package:	**WP 8 – Pilot Demonstration and Overall Evaluation**
Task(s):	**T8.2 – Realization and evaluation of Smart Energy MicroGrid Neighbourhood use-case**
Lead Beneficiary:	**ENERC**
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Executive Summary

The Smart Energy MicroGrid Neighbourhood, Use Case Pilot site was installed, as described in D7.2 in the third year of this four-year project. Its operation and performance were evaluated according to the framework described in D8.1 and the results are reported here. This Deliverable describes the operation of the pilot site, the methods used for the evaluation process and its findings, and concludes on its overall performance in the context of VICINITY and the way forward.

The results of the Use Case Pilot have been very encouraging, given the positive response the project has received from end-users. In fact, those involved in the demonstration either considered their participation in the project as positive (over 60% of the main users strongly agreeing). The implementation and reliability of the various Value-Added Services (VASs) using the VICINITY platform has underlined the value of the technical and market viability of both the VICINITY platform and the VAS. It has allowed us to create awareness and initial demand from other market parties for the solutions developed. Feedback from the end-users has allowed us to address system reliability issues, make user-interface improvements, and is creating opportunities for co-creation of new (user-led) solutions. Co-creation activities with students and teachers on Smart School functionality were encouraging and revealed the need to rely on this practice in the future. Technological promise of the platform could be revealed to the stakeholders/end users as functionality of the solutions.

Within the pilot site implementation, the project has achieved the full operational solution of the three VASs (Municipality Energy Efficiency and IEQ Services, Services for Citizens, and Distributed Energy Assets Management). An additional solution was co-created based on the market demand: IOT Inventory and the related performance monitoring of the systems. Data retrieved through the VICINITY platform has been correctly transferred in the form of readily understandable and actionable information to the end-users, demonstrating the full functionality of both the VICINITY Unique Selling Point 'Semantic interoperability as a service' as well as the value of the VASs.

End users have responded positively to the user experience and more importantly to the value of the VAS's, indicating a clear interest to continue using the system, suggesting further ideas of expanded sensor data inclusion, and potential co-creation opportunities within Smart Building, Smart School solutions. Meanwhile relevance and interest on the EU level as to climate services for citizens cannot be underestimated. Internally the ENERC team is interested to further develop the Smart Clean predictive services for systems maintenance within operations and management contracts. Showcasing the pilot to another municipality has led to an advanced discussion for commercial pilot implementation.

The next three months of the stakeholders' discussions and further co-creation is expected to yield commercialization opportunities beyond those already achieved. In fact, 100% of the main users would like to continue to co-create in the future, 30% of the responders expressing a strong readiness to do so.

Here follows some examples of answers:

**"Q: What features of the solution did you find most innovative?
A: The ability to integrate different equipment and brands into one platform."**

"Q: What features of the solution did you find most innovative?
A: Get real time data to be able to act on time."

"Q: Which features of this solution did you find most innovative?
A: The idea that, if set correctly, this system has a high potential to fit a very wide range of applications."

List of Definitions and Abbreviations

Abbreviation	Definition
EC	European Commission
EU	European Union
GDPR	General Data Protection Regulation
IoT	Internet of Things
KPI	Key Performance Indicator
P2P	Peer-to-peer
SDG	Sustainable Development Goals
UI	User Interface
USP	Unique Selling Point
UV	Ultraviolet Radiation
UX	User Experience
VAS	Value-Added Service
WP	Work Package

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1. Introduction

The deliverable implements the methodology and presents the results of the Pilot evaluation framework that was defined and analysed in D8.1. The evaluation framework targets the assessment of the degree of compliance of the VICINITY overall results to the user/business and technical requirements for the Portugal Pilot site.

The document is structured to introduce the following topics: pilot site description and the use cases (including updates made on D7.2 Report on Smart Energy Microgrid Neighborhood Installations Martim Longo Pilot Site), introduction of the evaluation process (evaluation parameters, methods, collecting evaluation evidence and reviewing collected information); followed by evaluation results including technical and business components (stakeholder engagement; Vicinity concept applicability to microgrid driven community, interoperability results).

Additional considerations are introduced related to potential additional Value Added Services resulting from the current implementations. The projects aims to contribute towards the Sustainable Development Goals and the relevant ones are outlined within the document.

The document covers the demonstration phase timeline of the project but does not constitute a final evaluation or business models full assessment at this stage of the project. It should be viewed within as a continuum of deliverables.

1.1. Context within VICINITY

The Pilot site of the Smart Energy MicroGrid Neighbourhood use-case, uses the VICINITY platform to demonstrate the feasibility of a solution that brings new services to the end users in several situations, while providing functionality, efficiency and increased awareness on the surrounding built and natural environment.

The Value-Added Services (VASs) in this pilot site in the Algarve, Portugal, provide new services to the end-users, utilizing data from IoT devices that function on diverse local and distributed platforms and are integrated in the VICINITY platform through VICINITY adapters. The Smart Energy Pilot Site aims to demonstrate how VICINITY can enable users to integrate IoT devices working on different platforms from different vendors into an efficient solution providing a useful service to the end-user.

Within the overall VICINITY project, this Pilot site aims at testing and validating with real life end users the applicability of a VICINITY enabled solution. The Vicinity project and platform are an intrinsic part of the pilot site, underpinning the development of the Martim Longo pilot site and the other sites in the project.

In WP8 the pilot demonstration and overall evaluation are implemented with D8.1 to present the business scenarios and evaluation framework while D8.2-D8.5 present the pilot results of each domain. Pilot sites utilize VICINITY platform to demonstrate benefits to users in terms of new functionalities, benefits and efficiency. The presence of real-life stakeholders greatly enhances the chances of further exploitation both locally and through worldwide dissemination of results.

KPIs were defined in D5.1 for all use cases of the pilot sites and evaluate the degree of overall satisfaction maintained. In D1.4 a set of business requirements per VICINITY domain were identified and will be further evaluated in this deliverable. More details on the evaluation methodology and evaluation parameters are described in Chapter 2. Overall project chronogram is presented in the following figure.

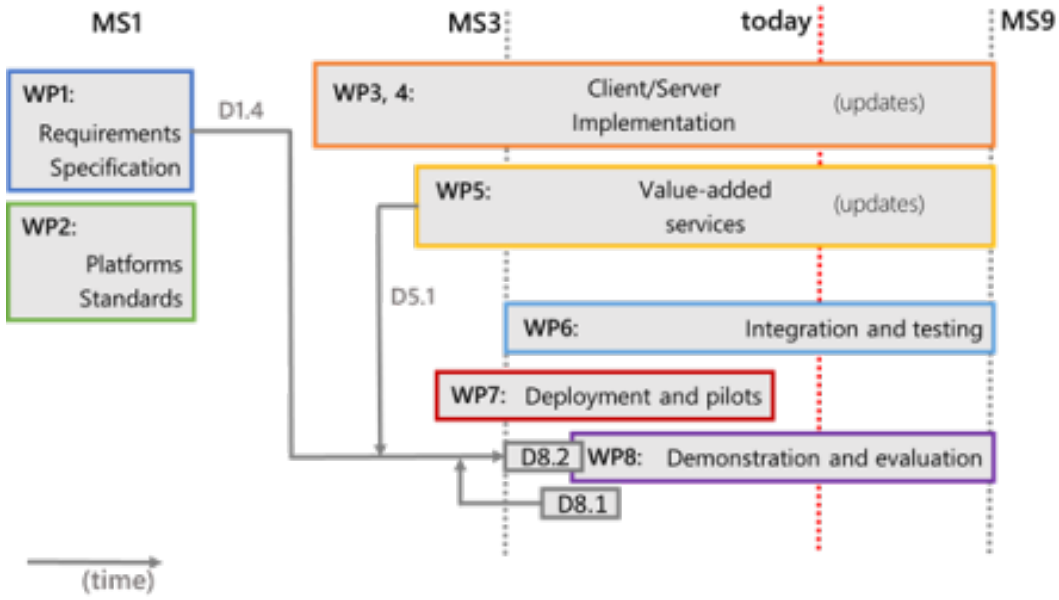


Figure 1 - VICINITY Project overview

The VICINITY VAS deployed at Martim Longo Pilot Site are: VAS1 - Municipality Energy Efficiency and IEQ Services (Figure 2); VAS2 - Services for Citizens VAS (Figure 3); and VAS3 - Distributed Energy assets management and SmartClean (Figure 4 and 5).

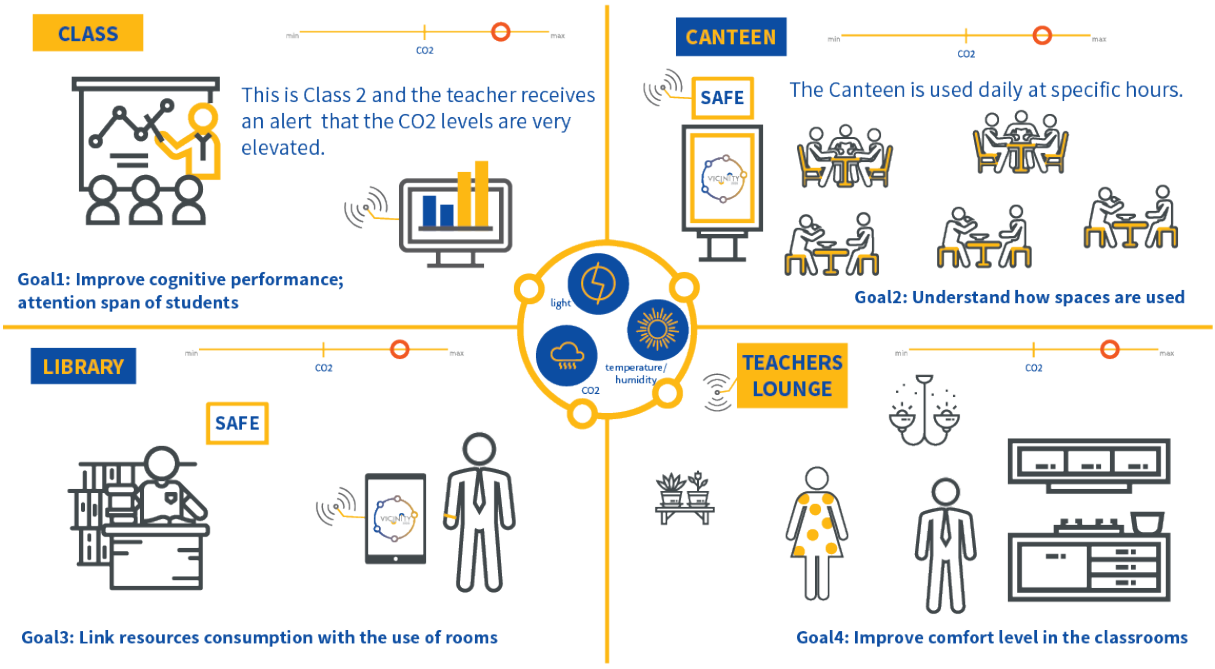


Figure 2 - Municipality Energy Efficiency and IEQ Services

Users story lines were co-created with the main DEMO site stakeholders, both internal to the organization as well as external. This was done to reflect expected minimal vale services outcomes related to each use case and Value Added Services. Figure 2 outlines the base line of the link between cross leverage of functionalities facilitated by VICINITY to provide insights related to space

use, conditions and resources consumptions combined in many ways. The approach related to alert notifications were established and some are graphically outlined above for illustration purposes. Based on this illustration approach reports and further functionality was developed, additional types of sensors added.

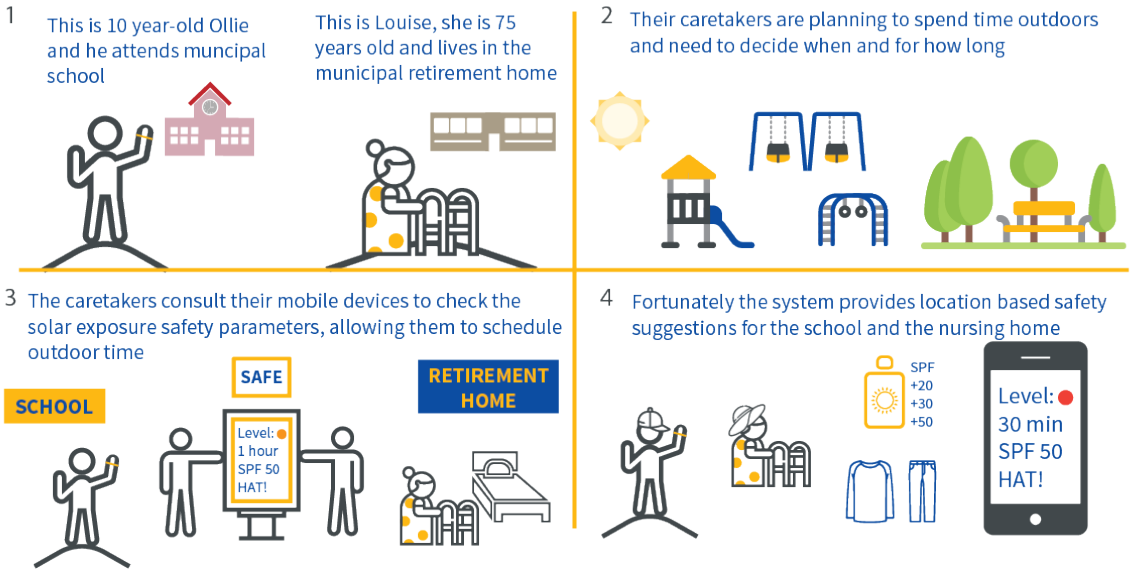


Figure 3 -Climate Services for Citizens

In Figure 3 a subset of climate related notifications is illustrated. Based on this suggestions a wider set of services was envisioned for further development, while demonstrating initially set functionality within the use case. School outing processed were modified based on information provided by the service. In the next iteration a greater set of information stream could be included to provide a complete service, while leveraging local resources coupled with external information services.
The initial scope of UV services VAS was augmented to Climate services for citizens to reflect growing need for information services in the period of climate change adaptation.

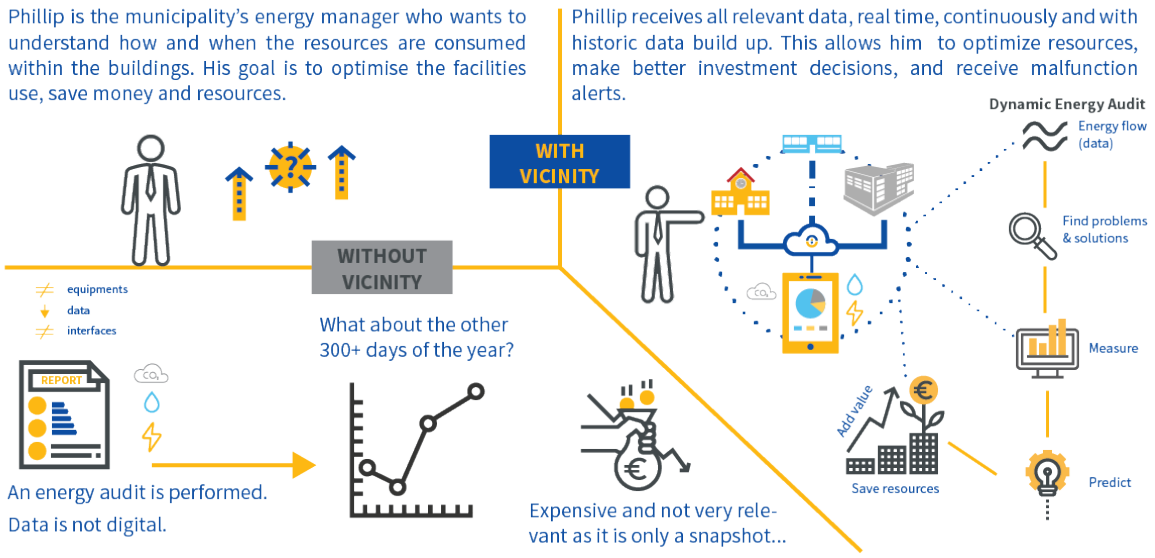


Figure 4 – Built Assets Management

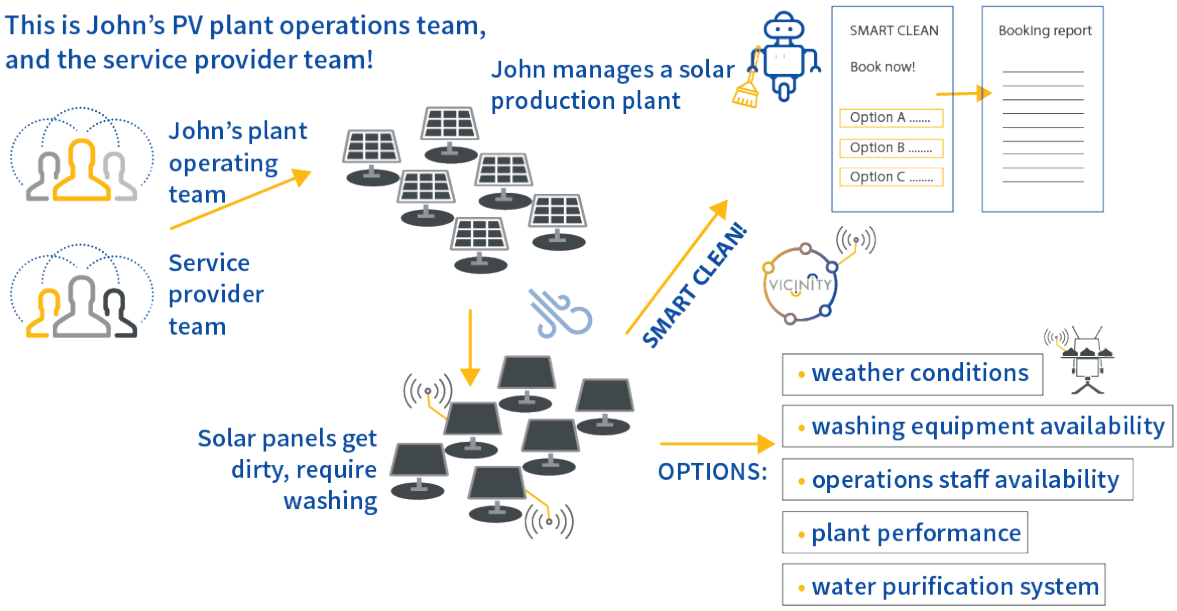


Figure 5 - Smart Clean

An outline of the user story diagram above for distributed energy assets management was used for identifying the most relevant processes. Based on this weather services and the use of resources coupled with the sensors driven data and external services a subset of the solution was created to address the needs, while demonstrating VICINITY as a platform. Future development of this solution is planned for large scale solar parks aimed at reaching operations and management optimisation.

An addition value added service was organically created based on the need to manage IoT based assets and create system performance monitoring tool. IoT Inventory VAS was created by the team to address the need.

1.2. Objectives in Work Package 8 and Task 8.2

The objective of T8.2 - **Pilot results of Smart Energy MicroGrid Neighbourhood use case** is to evaluate what has been made during the development of Pilot Site. The basis for the evaluation is described in D8.1 and further explained in appropriate chapters. The goal is to establish whether the Pilot Site managed to achieve the objectives of this task and provide a useful service to the end user as well as meet the KPI criteria. Different Pilot Sites from the domains of energy, building, transport and health are evaluated separately in D8.2, D8.3, D8.4 and D8.5 respectively.

ENERCOUTIM together with AAU, BVR, UNIKL are the responsible partners for the implementation and monitoring of the Martim Longo, Portugal pilot site, the respective use cases and value-added services.
User and stakeholders' experience was collected through this period in order to evaluate the implemented solution and to adapt to emerging requirements that arouse during the pilot realization phase. Whenever applicable and possible, especially through the business evaluation, the results after the VICINITY solution are compared to the baseline scenario to prove the advancements offered by VICINITY approach.

1.3. Description of the Pilot Site

1.3.1. Infrastructure

The ENERC pilot includes several buildings: the **Solar Lab** located on the Solar DEMO Platform, a cluster of buildings managed by the Municipality of Alcoutim, a **School**, a **Retirement home** and a **Sports Centre** including a **Swimming Pool**, and also a **private home**. The Municipality cluster of buildings, SolarLab and the private home form a neighbourhood both digitally and geographically are the setting for the use cases developed throughout the project.

Figure 6 shows the cluster of Municipal buildings and the private home where the equipment is installed, in addition to the SolarLab and the Solar Demonstration platform located 2,5 km northeast the village, in the direction of the arrow.
Heterogeniouse typology of buildings is valuable for ultimate combination of pulled resources within energy community context at the next stage of the solution development.
Based on real monitored energy consumption and building use patterns and a benchmark facility (Solar Lab) a microgrid neighbourhood potential can be facilitated based on the achieved results.

Figure 6 - Overview of buildings included in the Pilot Site at Martim Longo

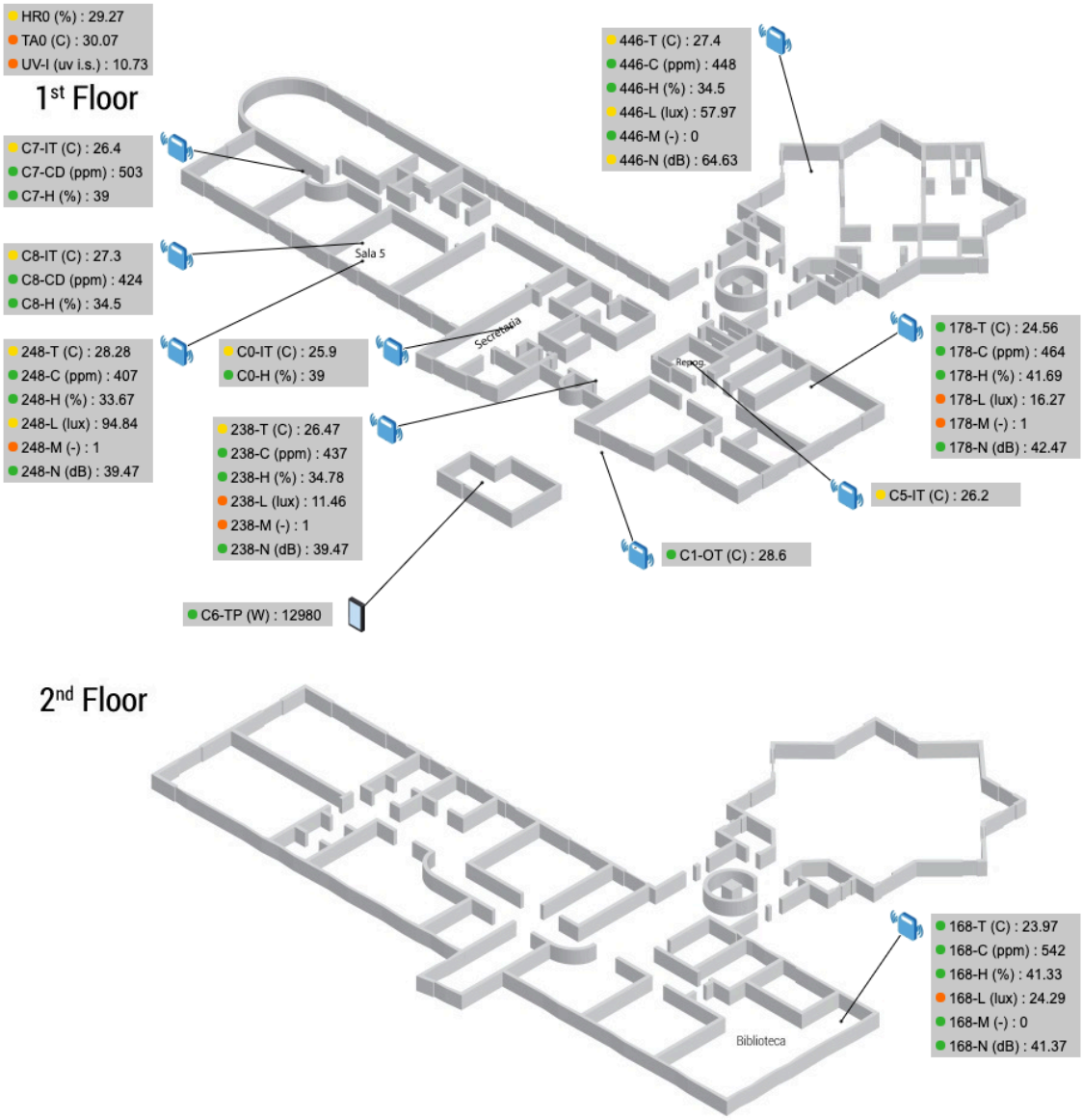


Figure 7 – Monitoring view of ENERCOUTIM Dynamic Building Audit Application for the Martim Longo School (Value-Added Service 1)

The VAS implemented at Martim Longo Pilot Site are described below.

1.3.2. VAS1 - Municipality Energy Efficiency and IEQ Services

VAS1 includes Use Cases as described in D5.2 and D7.2 deliverable.

Dynamic Building Audit, Flexibility and Smart School, allows the users, the building manager and the maintenance operators to know at any time the current state of the Internal Environment Quality of the building, resources consumption and usage of the facility.

Municipality Energy Efficiency and IEQ Services are deployed at the municipality cluster of buildings (School, Retirement Home, Gym and Swimming Pool) involving different stakeholders (Municipality, building administrators, teachers and students).

Different types of sensor devices are used to collect real-time information from the buildings, specifically: temperature, CO2, humidity, luminosity, noise, motion and energy consumption.

Dynamic Building Audit and Smart School VAS, process real-time values of sensor data and alert levels for monitoring and store historical data for IEQ quality and energy efficiency analysis.

1.3.3. VAS2 - Services for Citizens

VAS2 includes Use Case 2.9 as described in D5.2 and D7.2.

It provides useful information to the students; senior citizens and citizens in general about the UV level advisory for behaviour and outdoor activities planning and additional measures. UV for Citizens VAS is also a model for equipment usage and leverage beyond primary function.

Services for Citizens is composed of UV (Ultraviolet radiation) info services for Citizens. UV radiation is measured using a Kipp&Zonen UV sensor installed at SolarLab weather station. UV for Citizens Value-Added Service, processes real-time values of the UV sensor and displays current UV index value and advisory information.

1.3.4. VAS 3 - Distributed Energy assets management

VAS3 includes Use Cases 2.6 and 2.7 as described in D5.2 and D7.2.

It provides Platform Services, namely DER RES production optimization of operations and maintenance. The scope of these VAS is to help the operation and maintenance manager of the PV production plant to plan cleaning of the photovoltaic modules to increase energy production, reduce costs and plan resources allocation and usage.

Distributed Energy asset management services compare actual PV production against available radiation measured with specific sensors installed at the SolarLab weather station, monitoring the effective PV panel efficiency ratio, and storing a comprehensive set of data (weather data, radiation and PV production) for further statistical and technical analysis.

1.3.5. Business Orientation

Pilot evaluation use cases proposed from VICINITY project and VASs underlying concepts (detailed in D5.1), address a broad scope of concerns analysed with key stakeholders and geared towards:

- Improving health, comfort and productivity inside buildings
- Prevent overexposure to UV radiation and provide relevant informational services
- Provide a valuable asset management tool, focused on maintenance of PV panels
- Provide services based on various sources of gathered data to optimize use of buildings and resources consumption
- Provide learning tools and management mechanisms
- Provide tools for management of IoT systems installed base for inventory purposes, for performance management

The VASs derived from the use cases could be distributed as a SaaS distribution model for the main VICINITY platform and offer data monitoring and analytics services for any VICINITY compliant IoT infrastructures. Although there are pending reliability limitations in current VASs implementation that are being addressed as part of the continuous updates and upgrades procedures (Task 5.3),

current VASs are already considered by key stakeholders as competitive regarding usability, affordability, accessibility and technical support.

Data retrieved through the VICINITY platform has been correctly transferred in the form of readily understandable and actionable information to the end users, demonstrating the functionality of the both the VICINITY semantic interoperability as a service as well as the value of the implemented VASs.

1.3.6. Benefits from VICINITY

"The consortium stated that VICINITY's USP is its ability to enable data to be shared between a wide variety of devices by ensuring semantic interoperability among them at the metadata level so that the contents of the data can follow a separate path from the VICINITY platform to ensure privacy"

This USP translates into highly relevant features for the implementation of Martim Longo Pilot Site, namely: semantic interoperability as an enabler for a solution based on a wide variety of devices from different vendors; and a comprehensive data privacy approach addressing a major key stakeholders concern.

2. Pilot Sites Evaluation Process

According to D8.1 pilot Sites the evaluation framework defines two evaluation scopes. The technical and the business one. For the evaluation of each scope the following procedure was followed:

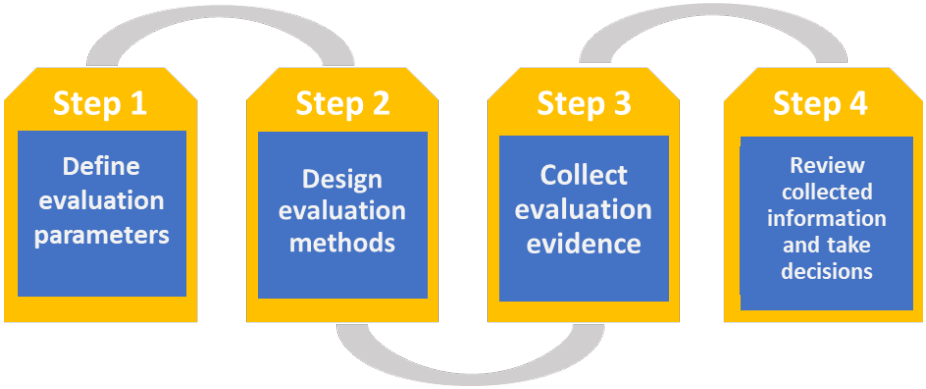


Figure 8 - Martim Longo pilot site evaluation process

2.1. Define evaluation parameters

In order to implement the technical and business evaluation of the VICINITY Portuguese pilot, which this deliverable focus on, an evaluation methodology was developed and it concerns the value of pilot applications and the user's perception of the VICINITY USPs.

The work implemented in D8.1, where technical and business KPIs were defined, provided the basis for developing the evaluation strategy which encompassed technical KPI statistics, delivery of questionnaires, interviews and meetings with the users and stakeholders.

The questionnaires focused on three main parameters. The first one, the use of IoT devices and VICINITY enabled services, aimed at evaluating the user's interaction with the VICINITY services, giving us the feedback needed for continuing to develop a better VICINITY enabled solution for users. The second parameter was the overall experience in the VICINITY project, which gauges the perception of the user towards VICINITY as a "brand". It is beneficial to know of how the users feel towards VICINITY so that a positive brand perception of VICINITY can be achieved. As in market analysis, to measure this brand perception, questions were designed and implemented for this purpose. The third and last parameter was privacy and use of personal data. D9.13 sets out that VICINITY's unique selling points is its privacy by design: "VICINITY USP is its ability to enable data to be shared between a wide variety of devices by ensuring semantic interoperability among them at the metadata level so that the contents of the data can follow a separate path from the VICINITY platform to ensure privacy". And so, questions targeting the user's satisfaction and perception of their privacy and use of data were included.

2.2. Design evaluation methods

The evaluation method for the pilots and its relevant parameters was described in D8.1. This method was applied, and it encompassed deployment of questionnaires, interviews, meetings with users and stakeholders and the autonomous gathering of data for the technical evaluation of the pilot application.

The questionnaires were very important to the business evaluation and to measure the three parameters that are used to determine both the user's perception of VICINITY USPs and their experience with the pilot application. Questions regarding the better use of the buildings and its resources were also used to further understand how the VICINITY based solution was "fit for purpose". But while the questionnaires were used in interviews and sent online at a final phase, the meetings with users and stakeholders were held throughout this pilot demonstration phase as to promote stakeholder engagement, gather feedback and to better contextualize KPIs. In this way a continuous evaluation was made throughout the demonstration phase and it was possible to act on feedback received and make corrections and improvements to several identified issues and limitations.

To further evaluate the perception of VICINITY a questionnaire targeted for potential users was also developed. These potential users were informed in the VICINITY services and the VICINITY enabled solution in the Portuguese pilot site and so their opinion and feedback were considered an important tool for evaluation.

The evaluation method for the technical KPIs is based on algorithms that collect and aggregate notifications of alerts (parameters outside critical boundaries), warnings (parameters outside recommended boundaries) and anomalies (sensor anomalies and connectivity issues), providing the data for the technical KPIs statistics.

2.2.1. Evaluation Checklist

The evaluation checklist defined in D8.1 was taken into consideration throughout the evaluation process consisting a guide for assuring the quality of the evaluation. The checklist of D8.1 is reproduced below, including the comments from the pilot site responsible.

Table 1 - Evaluation Checklist

Evaluation Step	Y/N	Comments
Appoint a person to be responsible for evaluation and 'run' the Task Gantt chart	Y	Pilot Site leader.
Train a person(s) to manage and run surveys, especially if EU Survey is chosen	Y	EU Survey was used.
Identify key stakeholders for surveys: users, service provider, infrastructure owners, site managers.	Y	Described in section 3.3.
Technical evaluation. Results of laboratory testing and 'hackathons' and key standards added to the Evaluation Spreadsheet.	Y	SolarLab DBA demonstration view was included in technical KPIs statistics.
Review the KPIs. Are they measurable? How will the data be gathered? Are sufficient dimensions identified for the Task, as in the Project Objectives?	Y	KPIs were reviewed to provide coverage for the evaluation parameters
Technical evaluation- by service provider. Are the IoT devices and gateways working correctly? How well? To what extent is 'interoperability as a service' achieved cross domain? Are the standards adequate for wide-scale deployment?	Y	Technical KPIs statistics for system parameters as connectivity (uptime) and sensor anomalies were included.
Technical evaluation. Are events being logged and anomalies being logged and sent to the evaluation dashboard? How many per day/week?	Y	Each DBA view includes a report for individual notifications and a report for inventory where aggregated values of alerts, warnings, uptime and anomalies for the last 30 day are presented for each sensor and ratio. A set of common KPIs has been defined and will be monitored in the evaluation dashboard which will be presented in D8.6.
Technical evaluation. Is the battery management/replacement process working?	Y	IEQ sensor devices with recurring battery issues were reconditioned to operate with an AC adapter.
Technical Evaluation. Does the Evaluation Dashboard give benefit for consolidation of results or showcasing? Have you a better local Evaluation Dashboard?	N/A	Expected to be complimentary as the ENERCOUTIM DBA application reports sensor specific confidential data and VICINITY Evaluation Dashboard is intended for public aggregate data.
Technical evaluation. How well are security and privacy requirements being met?	Y	Users and stakeholders are satisfied regarding VICINITY privacy and security features. A Communication Protection Diagram for the solution implemented at

		Martim Longo was discussed with partners and stakeholder
Technical evaluation. Are any fixes required resulting from the mid-trial evaluation?	Y	Though no mid-trial evaluation was implemented, evaluation is an iterative process and through the pilot site realization, feedback from stakeholders was taken into consideration for further enhancements and corrections.
Technical and business evaluation. How scalable is the solution?	Y	The solution is scalable, within the inherent limits of mid to high-resolution sensor data pooling in highly distributed applications.
Carry out user/stakeholder satisfaction surveys. Are the users' unmet needs being satisfied and are they satisfied with the performance of VICINITY?	Y	Detailed in section 3.3.
Business assessment. Does VICINITY add value (when comparing the 'with' and 'without' scenarios?). Did any unexpected benefits/demerits come from the trial?	Y	Described in section 3.3.
Business assessment. Does the solution justify further investment?	Y	Described in section 1.3.5.
Consolidate the results of the technical and business assessments, add them to the evaluation spreadsheet and prepare graphical visualizations	Y	Described in chapter 3.
Strategic benefit. How well does the VICINITY solution match the neighbourhood, citywide, regional and/or EU requirements?	Y	Described in chapter 4.
Prepare Reports to stakeholders including VICINITY Deliverables	Y	

2.3. Collect evaluation evidence

Since the questionnaires that were deployed had questions for both the technical and business evaluation the data collection was made simultaneously for both. The data was then processed through the EUSurvey tool, which provides analysis results, and was finally separated according to its use, business or technical. The questionnaires provided most of the information needed to make the evaluation but the meetings and continuous engagement with the stakeholders and users also provided information throughout the pilot demonstration.

The EUSurvey tool is a free-of-charge online survey tool, hosted in a European Commission website that offers privacy (GDPR compliant). It is the European Commission's official survey management tool. One of its main purposes is to create official surveys of public opinion. Its use for the purposes of the Pilot Site evaluation was a straightforward decision as it provided a secure and easy tool adequate for the purposes of the evaluation task. This tool was used and so it was the main way from which data was collected. The questionnaire sent was a "Open" survey which means it could be emailed to any participant by including the link to the questionnaire. The link to the questionnaire (see Annex for the link) was emailed to all the persons that used the pilot application (users and

stakeholders that got in contact with the service in workshops). In cases that were possible the questionnaire was given in a face-to-face meeting.

The Technical KPIs statistics are derived from the aggregated data of the notifications (Alerts, Warnings, Anomalies and Uptime) stored in the database. Aggregated data of the notifications is also available to the end-users in Inventory Report of each DBA view.

2.4. Review collected information and take decisions

In this stage data are processed, analysed and properly visualized in order to extract useful conclusions for the technical and business KPIs. Processed data from technical KPIs are presented through diagrams or plain numbers. Business evaluation results are presented through stacked bars to compare parts across different answer categories and presented in paragraph 3.2.

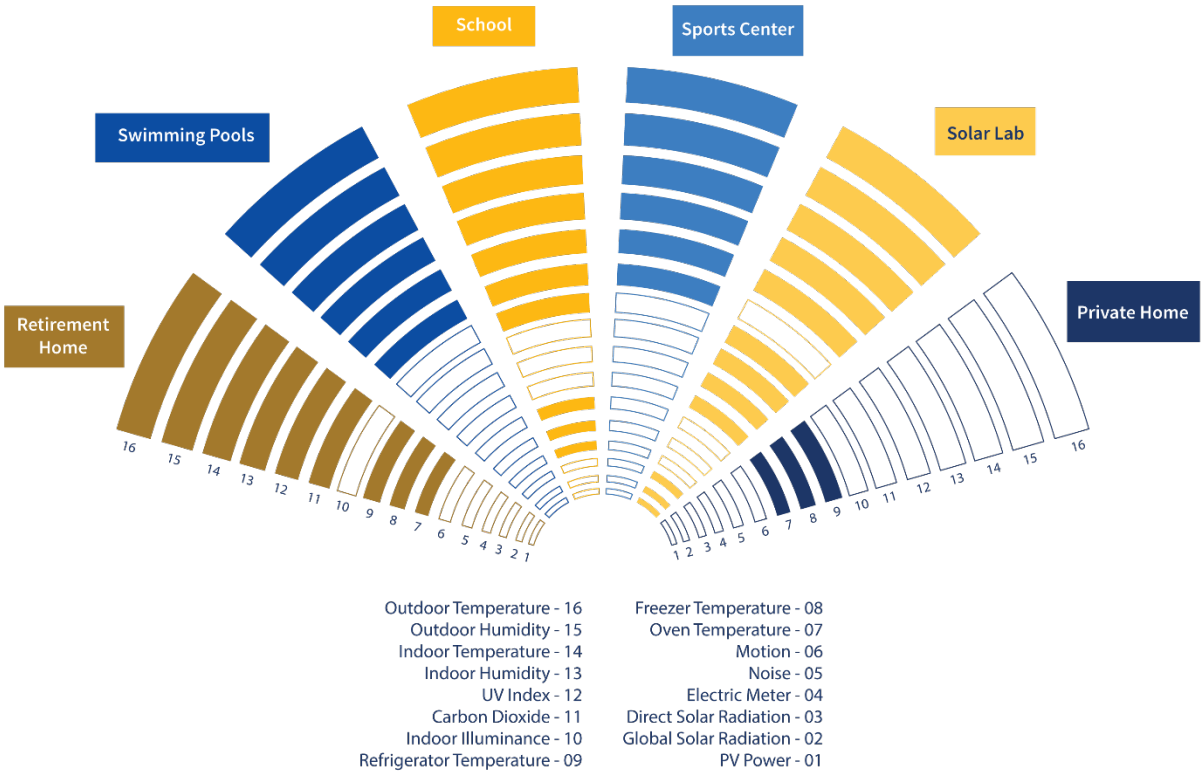


Figure 9 - Visualisation of the KPIs

3. Evaluation at Pilot Site of Martim Longo

3.1. WP1 requirements refinement

In WP1 Energy domain Requirements were defined for Martim Longo Pilot Site Use Cases. In the following table, the status of the requirements defined in D1.4 are analysed after pilot site installation and deployment.

VICINITY-BR-ENR010	*Novel data-driven cross domain B2B and B2C energy services*

Implementation of the ENERCOUTIM Device Adapter for Energomonitor (VICINITY Adapter) enables effective real time access to energy consumption from Energomonitor Energy Meters to any VICINITY compliant B2B or B2C VAS. Real time and historical energy consumption can be made available in the ENERCOUTIM Dynamic Building Audit application from any Energy Meter with a VICINITY compliant adapter and provides essential tools to support management decisions about energy consumption and usage.

VICINITY-BR-ENR020	*Managing energy sources across standards and vendors of the connected appliances*

Implementation of the ENERCOUTIM Device Adapter for Energomonitor (VICINITY Adapter) and of the ENERCOUTIM Device Adapter for SolarEdge (VICINITY Adapter) enables effective real time access to Energy Production Meters to any VICINITY compliant B2B or B2C VAS using the VICINITY platform. Real time and historical energy production can be made available in the ENERCOUTIM Dynamic Building Audit application from any Energy Production Meters with a VICINITY compliant adapter and provides essential tools to support management decisions about energy production.

VICINITY-BR-ENR021	*Visualise intermittent energy sources*

ENERCOUTIM Dynamic Building Audit application enables real time visualization of core energy production parameters from any VICINITY compliant energy devices through a user-friendly monitoring view where the values are inserted in an infrastructure plan. Historical production data can be visualized using predefined and customized graphs.

VICINITY-BR-ENR030	*IoT solutions as building blocks of demand response systems*

Implementation of the ENERCOUTIM Device Adapter for Energomonitor (VICINITY Adapter) and of the ENERCOUTIM Device Adapter for SolarEdge (VICINITY Adapter) enables effective real time access to Energy Production Meters to any VICINITY compliant B2B or B2C VAS using the VICINITY platform.

VICINITY-BR-ENR031	*Synergies with building*

The Dynamic Building Audit application enables definition of diverse alert and warning indicators, for IEQ monitoring as to process and contextualize sensor data. The table in the Annex specifies reference values for legal and optimal conditions. Outdoor weather data from the same sensors can be reused in different DBA views and associated with diverse alert and warning thresholds as to be meaningful to the specific purpose of any outdoor building areas as playgrounds, sports facilities, gardens and PV production areas.

VICINITY-BR-ENR032	*Hybrid fully-automated demand response systems*

Real time and historical energy production, storage and consumption can be made available in the ENERCOUTIM Dynamic Building Audit application from any devices with a VICINITY compliant adapter and provides essential tools to monitor, analyse and demonstrate the operation of fully automated demand response systems as the EATON xStorage system installed at the Martim Longo Solar Energy Platform.

VICINITY-BR-ENR040	*Behaviour influence on use of energy resources*

ENERCOUTIM Dynamic Building Audit application while constructing a comprehensive historical record of the monitored IEQ and Energy sensor data provides essential tools to investigate and demonstrate the advantages and disadvantages of specific IEQ and Energy technical solutions.

VICINITY-BR-ENR050	*Data ownership, data management*

The VICINITY platform implements a fine-grained permission architecture, managed by the VICINITY Neighbourhood Manager, where access and management permissions to the adapter of specific sensors and can be granted according the user profile.

The Dynamic Building Audit application implements a permission architecture where the access to specific DBA views and associated data is granted based on the user profile.

VICINITY-BR-ENR060	*Transparency needs in granting access to service providers*

The VICINITY platform implements a fine-grained collaboration architecture, managed by the VICINITY Neighbourhood Manager, where access to the data of specific sensors can be granted to specific third-party VICINITY compliant VAS, using VICINITY contracts.

VICINITY-BR-ENR070	**Solar Thermal energy production/consumption monitoring**

Real time and historical solar water heating data can be made available in the ENERCOUTIM Dynamic Building Audit application from any solar thermal energy production with a VICINITY compliant adapter and provides essential tools to monitor and analyse solar water heating system as the solar water heating system installed at the Martim Longo Solar Energy Platform.

VICINITY-BR-ENR080	**Energy and Water consumption monitoring**

Implementation of the ENERCOUTIM Device Adapter for Energomonitor (VICINITY Adapter) enables effective real time access to energy and water consumption from Energomonitor Energy and Water Meters to any VICINITY compliant B2B or B2C VAS. Real time and historical energy and water consumption can be made available in the ENERCOUTIM Dynamic Building Audit application from any Energy and Water Meters with a VICINITY compliant adapter and provides essential tools to support management decisions about energy and water consumption and usage.

VICINITY-BR-ENR090	**Weather Conditions for energy producers**

Implementation of the Datataker Device Adapter for Energomonitor (VICINITY Adapter) enables effective real time access to scientific weather and radiation sensors connected to the Datataker DataLoggers to any VICINITY compliant B2B or B2C VAS. Real time and historical weather and radiation data can be made available in the ENERCOUTIM Dynamic Building Audit application from any Weather Station with a VICINITY compliant adapter and provides essential tools to support operational and management decisions of energy producers.

VICINITY-BR-ENR100	**EV Charging Integration**

This requirement is being address in a co-creation process with DrEVen within scope of the 2nd VICINITY Open Call.

VICINITY-BR-ENR110	Oven and Fridge usage monitoring
Real time and historical Gorenje Oven, Refrigerator and Freezer usage data is made available in the ENERCOUTIM Dynamic Building Audit application from Gorenje using a VICINITY contract. DBA defined Alerts and Warnings for Gorenje Appliances can be visualized or emailed to users according to their preferences.	

VICINITY-BR-ENR120	Solar Panels Soiling monitoring
Real time and historical weather, radiation and PV energy production data can be made available in the ENERCOUTIM Dynamic Building Audit application from any Weather Station and PV with a VICINITY compliant adapter and provides essential tools to evaluate PV panels soiling and anomalies, including real time determination of the PV panels efficiency ratio and historical data export capabilities for further statistical and technical analysis.	

VICINITY-BR-ENR130	Energy consuming equipment, use of facilities patterns by tenants
ENERCOUTIM Dynamic Building Audit application while constructing a comprehensive historical record of the monitored IEQ and Energy sensor data provides essential tools to investigate building usage patterns and how they combine with external parameters as outdoor temperature, to justify energy usage for heating, ventilation and air conditioning.	

3.2. Technical Evaluation

The parameters for technical assessment were identified in D8.1 for the Value-Added Services of the Pilot Site and intend to capture if the buildings operate under optimal IEQ and Energy efficiency conditions and how frequent is the occurrence of critical situations.

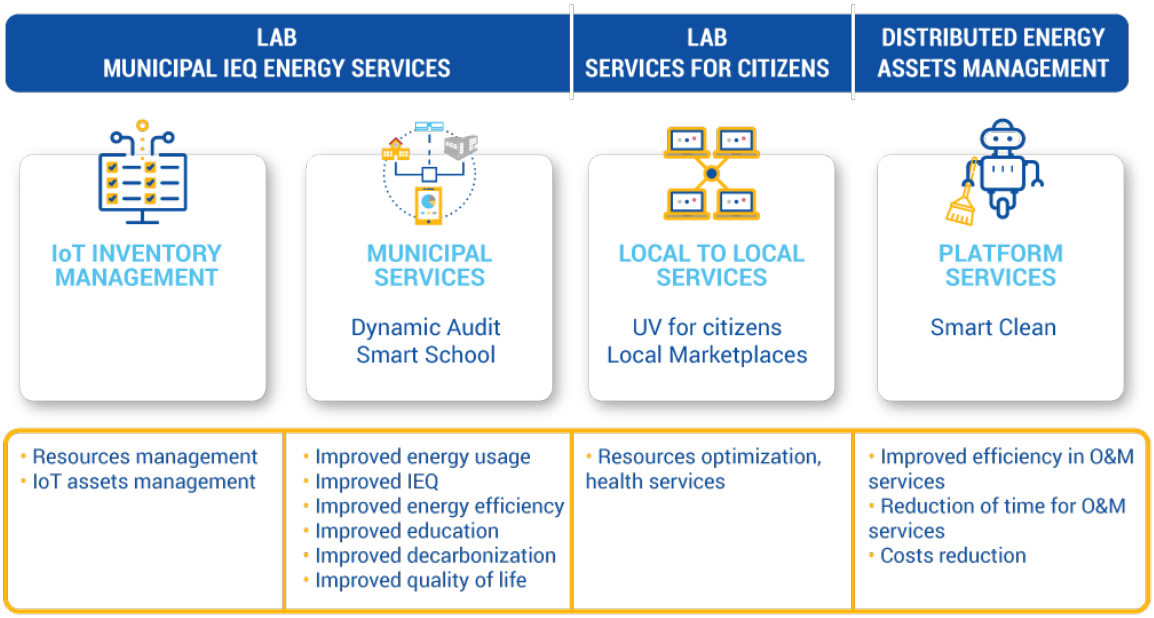


Figure 10 - Enercoutim Pilot Site – VAS categories

To obtain the KPIs required for technical assessment of each VAS, algorithms were developed to collect and aggregate specific types of events related with the evaluation parameters (alerts and warnings) and the operational conditions of the implemented solution (anomalies and uptime).

3.2.1. VAS1: Energy Efficiency and IEQ Management in Municipal Cluster of buildings – Municipal Services.

Municipality Energy Efficiency and IEQ Services – Dynamic Building Audit, Flexibility and Smart School, allows the users, the building manager and the maintenance operators to monitor the current state of the Internal Environment Quality of the building, resources consumption and usage of the facility. VAS1 KPI table refers to IEQ sensors, Gorenje Appliances and Energy consumption sensor deployed at the Municipality Cluster of Buildings, SolarLab and a private home included in Martim Longo Pilot Site.

Alerts and warnings are reported in the Dynamic Building Audit application as notifications for the relevant views of the specific buildings and can optionally be subscribed as email notifications. Notifications are issued as Warnings when the monitored parameters are outside the recommended boundaries and as Alerts when a legal or safety threshold is surpassed.

Table 2 - VAS1 KPIs

VAS1 KPIs from 20-08-2019 to 20-09-2019 (30 days)				
Active Sensors		Alerts	Warnings	Percent time optimal
Indoor Carbon Dioxide Sensors	13	111	253	96.1%
Indoor Humidity Sensors	15	101	361	95.7%
Indoor Temperature Sensors	16	1020	8544	17.0%
Indoor Noise Sensors	4	0	22	99.2%
Gorenje Freezer Temperature Sensors	3	0	336	84.4%
Gorenje Refrigerator Temperature Sensors	3	0	180	91.7%
Gorenje Oven Temperature Sensors	3	0	0	
Energy Usage Meters	4	0	6	

Although substantial effort is being done to adjust and reconcile warning thresholds with user preferences and alerts thresholds with relevant legal and safety boundaries, several notifications correspond to false positives, namely: the alerts and warnings related with indoor temperatures of unused rooms where the air conditioning remains off; and also, specific user preferences of freezer and refrigerator temperatures and modes of operation (FastFreeze) that can generate warnings according to the current threshold criteria as they may not be strictly necessary and entail unnecessary energy usage.

Therefore, some of the VAS1 KPIs entail immediate attention such as CO2 room levels, while others must be understood as indicative and dependent of contextualization as indoor temperature, since they tend to overemphasize some IEQ issues.

Table 3 - System KPIs for VAS 1 Sensors

System KPIs for VAS 1 Sensors from 20-08-2019 to 20-09-2019 (30 days)			
Active Sensors		Sensor Anomalies	Uptime
Indoor Carbon Dioxide Sensors	13	12	89.3%
Indoor Humidity Sensors	15	1	89.9%
Indoor Temperature Sensors	16	1	90.3%
Indoor Noise Sensors	4	0	95.0%
Indoor Luminosity Sensors	6	0	95.3%
Indoor Motion Sensors	5	0	96.0%
Gorenje Freezer Temperature Sensors	3	0	66.1%
Gorenje Refrigerator Temperature Sensors	3	0	66.1%
Gorenje Oven Temperature Sensors	3	0	66.1%
Energy Usage Meters	4	0	39.1%

Although no incidents in the VICINITY platform were detected for the reported period, overall uptime weighted average for VAS1 sensors was 85.3%. Sensor anomalies for VAS1 were occasional and with very limited impact in downtime, while local connectivity incidents with wi-fi networks or within sensor specific networks, generated downtime and originated the reported uptime for Gorenje Appliances (66.1%) and Energy Meters (39.1%).

It should be noticed that local connectivity incidents don't always involve equipment failure and often result of device relocations and reconfigurations.

3.2.2. VAS2 (Use case 2.9): Services for citizens. Complementary information for VAS1 and VAS3.

Weather data is shared by VAS1, VAS2 and VAS3. Alerts were mostly related with the occurrence of air temperatures above 35 ºC, as this impacts outdoor recreational activities at the Martim Longo School and Retirement Home, and cleaning interventions of PV panels.

Table 4 - VAS2 KPIs

VAS2 KPIs from 20-08-2019 to 20-09-2019 (30 days)			
Active Sensors		Alerts	Warnings
Weather Sensors (Temperature, Humidity and UV Index)	4	34	649

Although some sensor anomalies were detected most of the downtime for the reported period resulted from infrastructure improvements interventions and local connectivity incidents within sensor specific networks.

Table 5 - System KPIs for VAS2 Sensors

System KPIs for VAS2 Sensors from 20-08-2019 to 20-09-2019 (30 days)			
Active Sensors		Sensor Anomalies	Uptime
Weather Sensors (Temperature, Humidity and UV Index)	4	7	93.0%

3.2.3. VAS3 (Use cases 2.6, 2.7): – Distributed Energy assets management – Platform Services.

Technical KPIs are of limited use for the evaluation parameters of Distributed Energy Assets Management as maintenance interventions planning and PV production monitoring depend mostly on the statistical analysis of the data collected by the sensors over different periods with comparable radiation and weather conditions.

No sensor anomalies were detected and most of the downtime for the reported period resulted from infrastructure improvement interventions and local connectivity incidents within sensor specific networks.

Table 6 - System KPIs for VAS3 Sensors

System KPIs for VAS3 Sensors from 20-08-2019 to 20-09-2019 (30 days)			
Active Sensors		Sensor Anomalies	Uptime
Energy related Radiation Sensors (Global and Direct Solar Radiation)	2	0	92.1%
Energy Production Meters	3	0	98.3%

3.3. Business Evaluation

The questionnaires were distributed among two types of stakeholders: main users (or current users within strict scope of Martin Longo Pilot site) and potential users of the VICINITY platform that were informed about the project and the VASes. Potential users have access to the SolarLab demonstration view of the ENERCOUTIM DBA application, with login credentials, enabling them to answer questions about the ENERCOUTIM DBA application that do not require an effective usage context.

Although about 35 questionnaires were sent out or presented in person, not all answers were received. At time of reporting of the deliverable, only 16 answers were available (6 main users and 10 potential users). The information they present is considered interim and final results will be presented at the end of the project in D8.6. As most of the answers received relates to VAS1 and VAS2, more questionnaires will continue to be distributed so there is as much feedback as possible during the project calendar of execution on all the three VASs.

The main users provided answers to the questionnaires that described their experience in the use of the VICINITY platform within the context of the Martim Longo pilot site. The potential users provided answers based on their knowledge of the services the platform offers and their experience using the SolarLab demonstration view of the ENERCOUTIM DBA application and an overall context of IoT enabled solutions.

The results are presented in the following pages, in the form of bar charts, which make the answers easy to comprehend, demonstrate positive and encouraging results as they visually show the type of responses. Responders were asked to choose an answer to each sentence; each is color-coded in the bar charts as shown below. Answers were aggregated for each question as percentage of the total number of answers. Other questions were open, requiring a descriptive text.

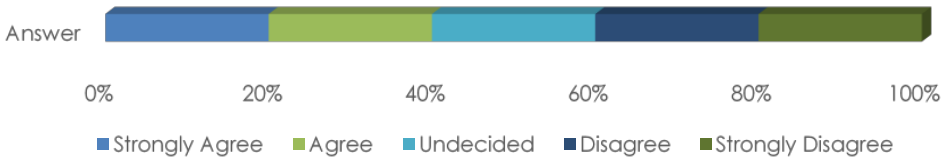


Figure 11 - Range of possible answers in questionnaires

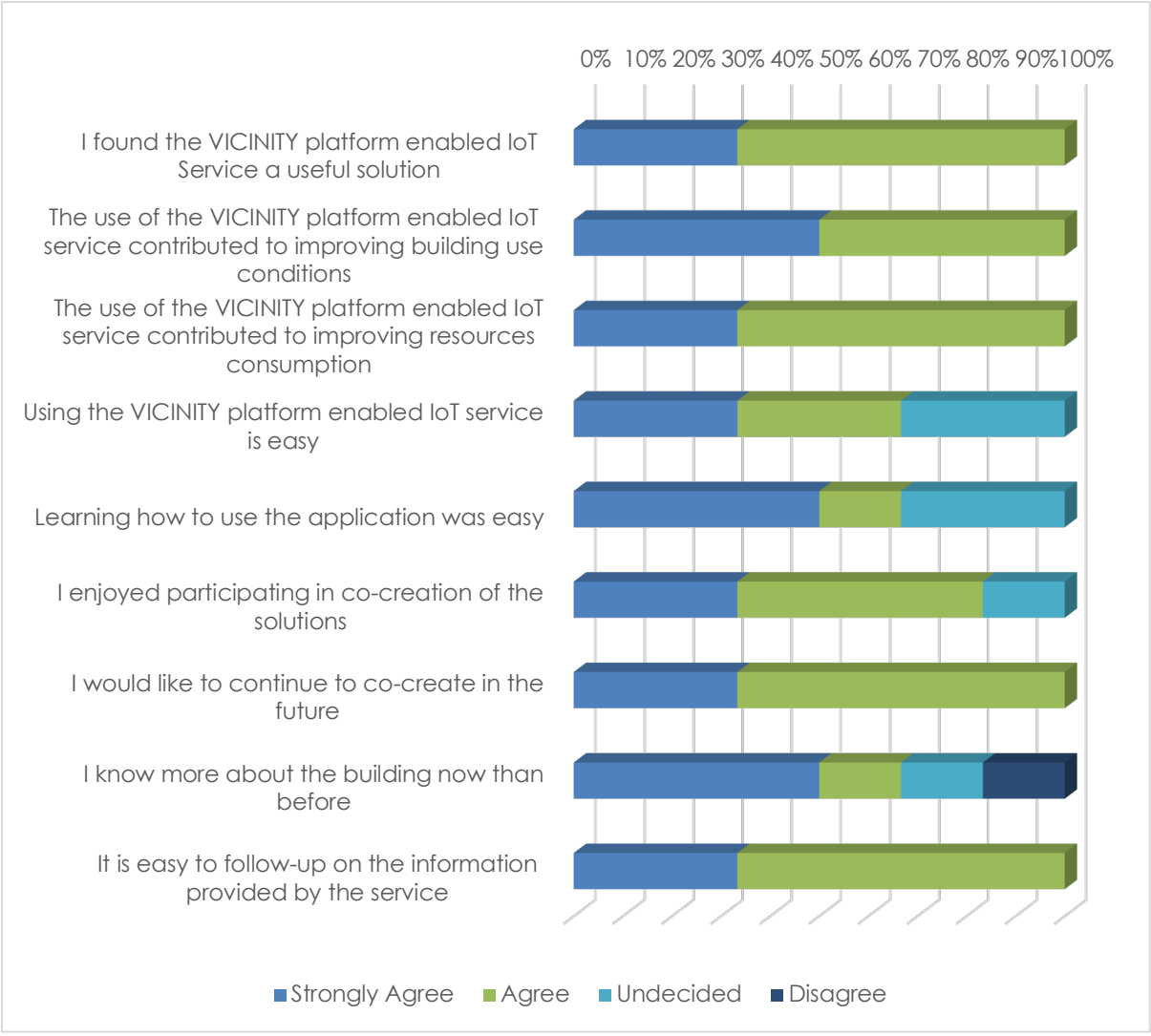
3.3.1. Main users

About 80% of the main users were Technical users such as infrastructure manager, building manager, engineer or technician, and 20% general users (teachers, nurse, caretaker and other members of staff).

Use of IoT Devices/Services

Main users report a positive experience with the VICINITY platform, considering it useful and easy to use and revealing positive results in terms of results for the resource consumption. About 60% reveal they know more about the building than they did before. Most are interested in the future developments of co-creation associated with the VICNITY platform services.

Table 7 - Main Users: Use of IoT Devices/Services



In terms of what features of the solution the main user found most innovative, opinions were positive about the overall quality and the fact that it effectively connects diverse sensors from different brands and achieves a unified IoT platform with cross-domain data, and also that there is actionable real-time information available.

In what the stakeholders consider can be improved, suggestions were made towards the technical follow-up, the platform interface and further development of the process of showing optimal boundaries, warnings and suggested actions. Also, some responders suggest improvements to the user interface, and the possibility to extend this solution to many other situations beyond the specific domains within the VICINITY project.

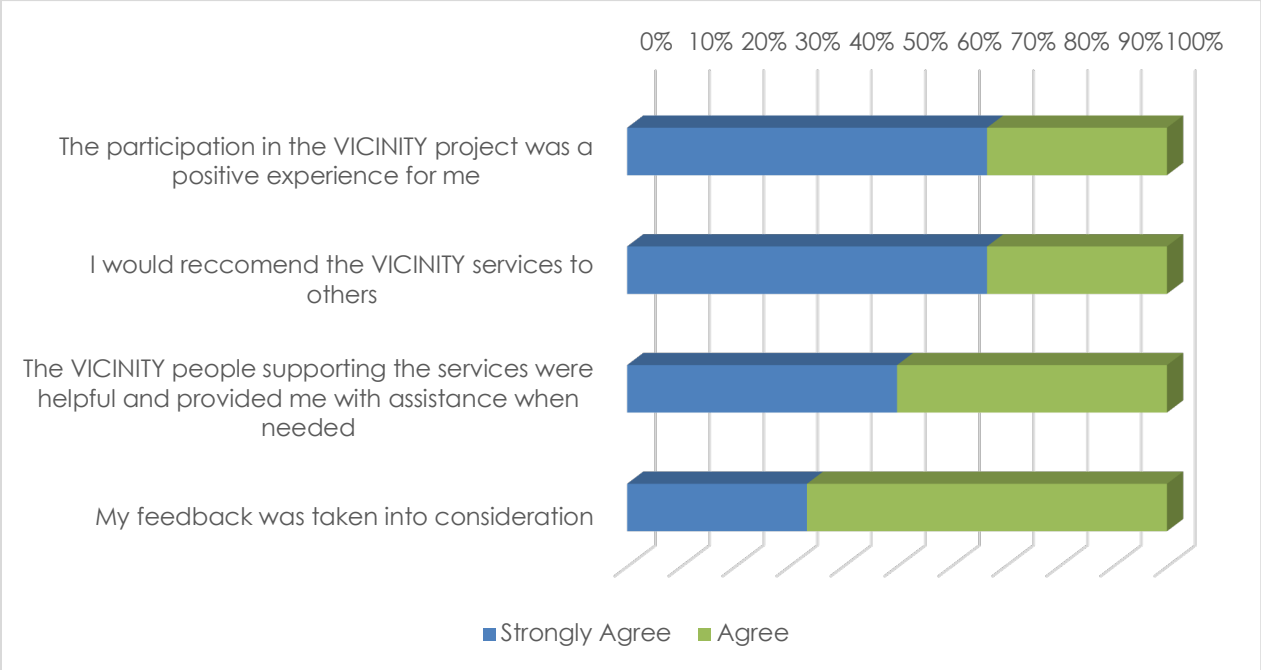
In terms of assessing if the users feel they needed any prior technical knowledge to use the application, most answers replied no, revealing its use is straightforward, although there is room for improvement in the way the information is presented and additional information would be welcome by some.

No specific identification of competitors was made, that would offer a similar solution to VICINITY.

Overall experience of Participation in the VICINITY project

On the overall experience of main users in participating in the VICINITY project, responses were all positive, considering all the aspects expressed in the table below. The VICINITY solution would be recommended by all the responders, and they considered the level of support was adequate and they felt part of the co-creation process, having their opinions heard.

Table 8 - Main Users: Overall Experience of Participation in the VICINITY Project



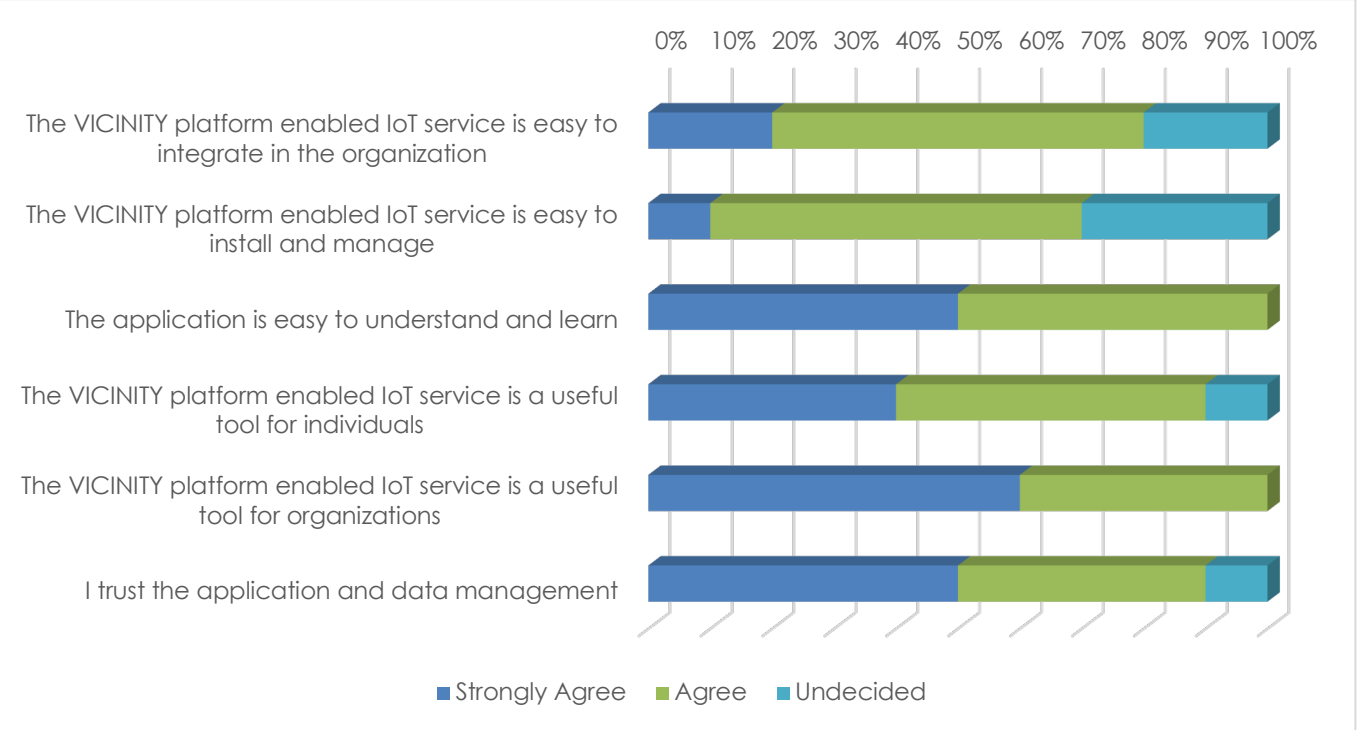
In terms of technical problems encountered during the course of the experiment, 60% reported having had problems, such as disabled sensors due to batteries running out of power and also some

difficulties in operating Gorenje appliances connected to the system. Some integration and connection issues were also reported.

Privacy/Use of Personal Data

In what concerns privacy and use of data, main users are mostly positive in terms of their data being well managed and no concerns were raised regarding this aspect.

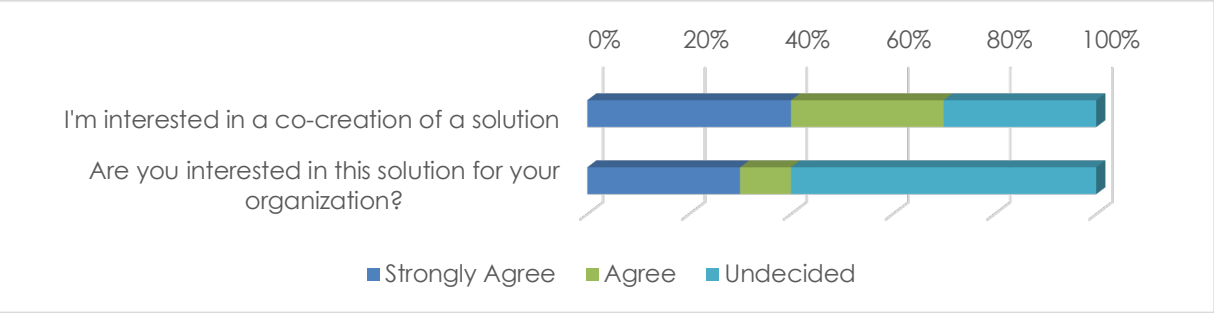
Table 9 - Potential Users: Vicinity Platform Enabled IoT Service



VICINITY platform enabled IoT service development

Over 60% of the responders are interested in being part of a co-creation process envisaging further developments of the platform, which is a measure of the interest it has raised among potential stakeholders. However, only about 40% consider that it is interesting for their own organization.
These results give viability to the users' co-creation and agile development, high level of engagement of the end users.

Table 10 - Potential Users: VICINITY platform enabled IoT service development



Most innovative technical enablement features

Among the features considered the most innovative, the following were put forward by responders:

1. The semantic interoperability, which is a main feature of the VICINITY platform;
2. Data Structure of Value-Added Services: data is presented in a straightforward way for the demonstrated solutions;
3. Visualization of various parameters with detail: presenting real time IEQ information that would otherwise not be available; the possibility of fitting to a wide range of applications, such as supply and demand management;
4. Possibility to monitor several devices at the same: it was highlighted as a unique feature, allowing for a better understanding and control of the overall consumption of the resources in the system, making operational and management tasks more efficient.

Features that can be improved

In terms of what can be improved and building on what already achieved at the pilot DEMO site, some aspects were identified, such as: the need to produce additional reports automatically; more actionable suggestions from the information gathered; allowing for more adapters to cover more technologies; and more automation during integration and interaction with equipment (such as HVAC) to improve parameters.

No competitors offering a similar solution could be named by the responders.

3.3.1. Unique Selling Points

From the relatively limited sample of main users, that interface with the pilot site facilities that have provided the input into the questionnaires, main conclusions can be already drawn in terms of the business value that stakeholders perceive in the solution, both in terms of the tool they were using and also in terms of the overall VICINITY platform.

The fact that semantic interoperability in the VICINITY Platform that allows for effective integration and use of a wide range of devices and applications within a use case, regardless of a brand/ manufacturer, is highlighted as a unique feature. Also, the possibility of integrating complementary solutions and functions, such as supply and demand management is viewed as very positive. Hence, attributes of the scalability and agility of the platform, while proven as a stable solution during the demonstration phase can be singled out as positively perceived characteristics.

In what concerns the pilot site in Martim Longo, reviews show positive aspects, namely the fact that the information is presented in a very straightforward way to final users, and it is easy to understand even without technical expertise, need to learn the system extensively or have prior knowledge of the regulatory environments. The system allows users to be aware of information that they were not aware of before and are considered important, such as the indoor environmental parameters, resources consumption and other parameters impacting health, well-being, and tech parameters for systems optimization, buildings use and resources consumption.

Richness of data, flexibility of integration of external data sources, dynamic development flexibilities are valued parameters from system development standpoint that complement users perceptions of usability of solutions they are provided.

The visual below in Figure 12 outlines the three areas of impact driving Value proposition of the overall solution: Interoperability angle, Collaboration facilitation, Efficiency sources resulting in two main value drivers. These impacts can be observed for each VaS demonstrated at the pilot site. Main impact criteria are summarised in the figure below that lists Interoperability value parameters resulting from heterogeneous devices connectivity possibilities, efficiency value add and resulting value from improved IEQ.

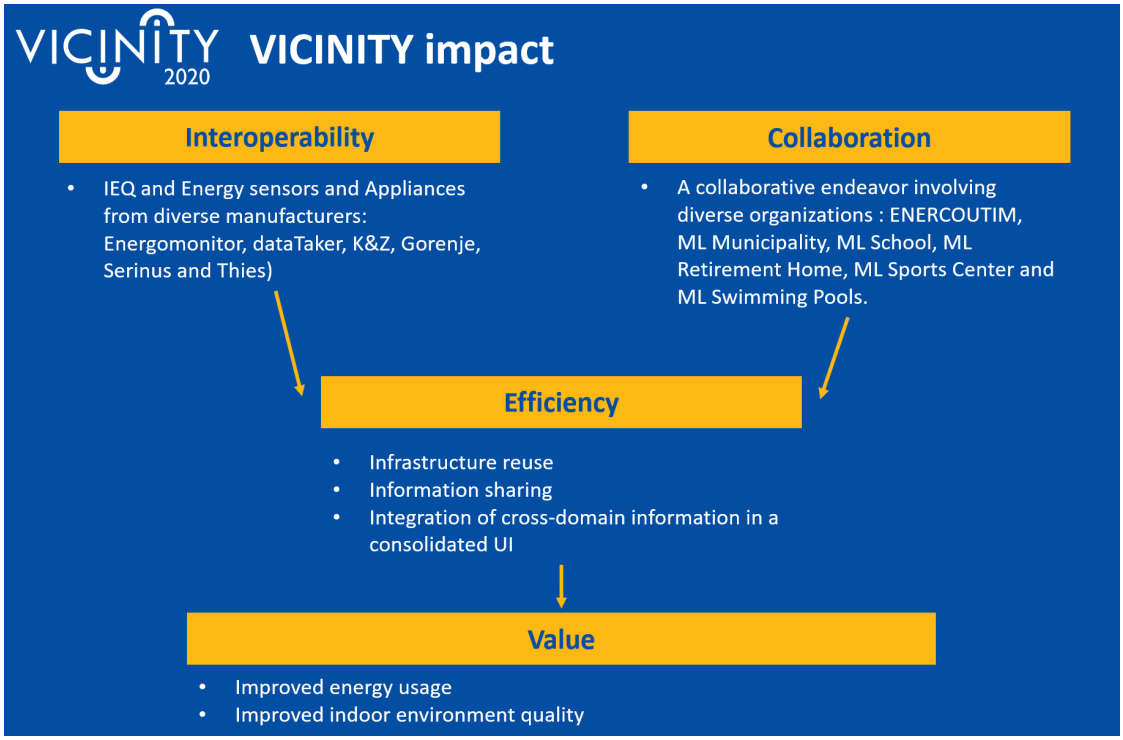


Figure 12 - VICINITY platform and stakeholer value formation for the solution implemented at Martim Longo Pilot Site.

4. Evaluation regarding sustainability Goals

The Sustainable Development Goals (SDGs) are a collection of 17 global goals set by the United Nations General Assembly in 2015 for the year 2030. The ENERC team reflected on the developed solutions and evaluated fit and match to the goals.

There are 169 targets for the 17 goals. Each target has between 1 and 3 indicators used to measure progress toward reaching the targets. These targets are reachable through a combination of solutions, processes and collaborations.

Figure 13 - The 17 Sustainable Development Goals set by the UN

These goals are a call for action by all countries to accelerate progress on sustainable development aimed at securing healthy, peaceful and prosperous life to all. The VICINITY pilot site in the Smart Energy Building domain could contribute towards Goals 3, 4, 7, 11 and 13 as indicated below. The team is working on the wider scope of the results communication at various stakeholders' levels and linking with regional (Algarve region) strategic plans within RIS programs.

Goal 3 - Ensure healthy lives and promote well-being for all at all ages
The Smart School Use case promotes improved well-being and better indoor air quality that is part of a healthy living environment, namely contributing towards Target 3.9: Reduce illnesses and deaths from hazardous chemicals and pollution

Goal 7 – Ensure access to affordable, reliable, sustainable and modern energy for all
The Use case Distributed energy assets can contribute to the widespread use of renewable energy conversion equipment, moving towards Target 7.3: Double the improvement in energy efficiency.

Goal 11 – Make cities and human settlements inclusive, safe, resilient, and sustainable
Better indoor environment, affecting the huge building stock in Europe can be an outcome of the VICINITY use case Municipal energy efficiency, including smart school. This can contribute towards Target 11.3: Inclusive and sustainable urbanization, namely SDG INDICATOR 11.3.2 Urban planning management.

Goal 13 – Take urgent action to combat climate change and its impacts by regulating emissions and promoting developments in renewable energy
UV radiation protection, included in Use case "Services to citizens", can be a valuable output in the context of this SDG. This can contribute towards Target 13.B: Promote mechanisms to raise capacity for planning and management.

5. Conclusions

Recognizing the importance of the valuation phase and the fact that it is difficult to separate the perceptions of the solutions (VaS) and the scope of the VICINITY as a solution, ENERC team reflected upon these challenges and structured the evaluation methodology to address this with stakeholders and potential users. The pilot evaluation framework has been defined in D8.1 and in this deliverable the results of Martim Longo pilot use cases demonstration phase are presented. Technical KPIs were evaluated based upon data gathered automatically at multiple VICINITY enabled sites. Stakeholders' opinions were gathered, as expressed in the questionnaires. These indicate that the VASs and the use cases achieved key business objectives and met the requirements. The scope and breadth of the solutions demonstrated exceeded the initial scope, since the technical functionality evolved during the demonstration phase. This demonstrates the benefits of the co-creation process that was undertaken, since developed technical functionality evolved during the demonstration phase.

The results of the surveys gathered through questionnaires were limited in the number of samples. Nevertheless, the scope was wide and stakeholders representation reflected this. A heterogeneous group of respondents have provided very encouraging feedback indicating as to the value of the Unique Selling Point of VICINITY 'Semantic interoperability as a service' solution, from technical enablement stand point. Major project stakeholders of the pilot site indicated strong interest in the VAS's provided in the pilot for various segments of the buildings functional use: Smart School, Municipal buildings management etc.

From a technical perspective, the solution has proven robust, although some improvements, reflecting the agile development approach, have been made to the system components, such as: sensors performance and reliability; end-user interface and usability levels. These improvements went beyond the pilot´s main goal of demonstrating feasibility of VICINITY as a platform for IoT auto-discovery and interoperability.

In terms of sensors' reliability, the micro-electronics sector is investing significantly in driving better and cheaper sensor products across the board, with significant improvements noted with each sensor upgrade to reach the market. Regarding the consumer interfaces (UX and UI), efforts are already underway to upgrade the user interface (UI), which we expect to continue as more functionality is added and further users' feedback is obtained allowing us to further fine-tune the users' experience per solution (VAS). Main users feedback on the ease of use show that there is room for improvement in some key aspects, thus moving towards increasing the current figure of 60% that consider the VICINITY solution easy to use.

The business proposition evolved during the project development cycle. It is considered to be viable for further commercialization and market-focused solutions. In fact, 100% of the responders agreed that they would recommend the VICINITY services to others, in what can be interpreted as a sign that the solution has a wide universe of application. The ENERC team understood that, during the course of the project implementation, the solution utility and perception of the system value at the user

level has leapfrogged. It is only through addressing customers' direct needs related to their functions and daily tasks that it is possible to better-position the technological value of the VICINITY solution. The interaction with the technical team was considered satisfactory, with all the responders stating that they were able interact with the team whenever needed.

The ability of the user to access the multiple data sources in an easy and comprehensive way has created awareness of the importance of such real time data (which was previously not available, and therefore there was little awareness of its importance). In fact, 100% of responders considered that there was an improvement in the building use conditions, although some felt somewhat dissatisfied with their knowledge of the building, 16% considering their knowledge had not improved. The next step is fine-tuning the use of data in task facilitation and solutions. The understanding of the information received and its impact on health, cognitive capacity, use of facilities, energy efficiency and future energy flexibility was quickly grasped by most users, and its value noted in the demonstrations.

Moreover, interest from other municipalities has already led to current advanced discussions on implementation of the system across a number of schools and other municipal buildings. This will allow ENERC team to move to a commercial pilot phase to prove the support for future viability of the VICINITY platform. Wider deployments and the related business models are under development VICINITY and discussion stretching beyond demonstration phase of the project. The team is encouraged by the results achieved and being able to advance the solution beyond the original scope of the pilot.

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7. ANNEXES

7.1. Gantt Chart

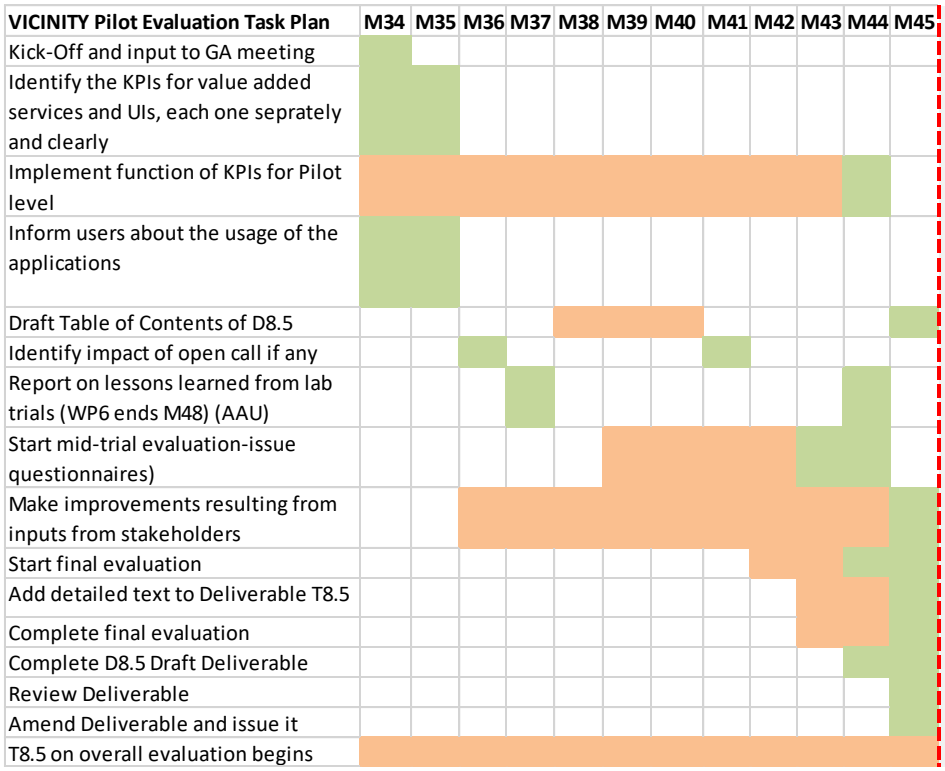

Figure 14 - Gantt Chart for T8.2

7.2. Questionnaires

7.2.1. Use Cases – Users

Questionnaire distributed link: https://ec.europa.eu/eusurvey/runner/VicinitySurvey

Table 11 - Questionnaire for Use Case users

VICINITY Program – Portuguese Pilot Case Questionnaire
Use Cases: ??
Memo: 1. Strongly agree, 2. Agree 3. Undecided 4. Disagree 5. Strongly disagree
Use of IoT Devices/Services
1. I found the VICINITY platform enabled IoT service a useful solution
2. The use of the VICINITY platform enabled IoT service contributed to improving building use conditions
3. The use of the VICINITY platform enabled IoT service contributed to improving resources consumption
4. Using the VICINITY platform enabled IoT service is easy
5. Learning how to use the application was easy
6. I enjoyed participating in co-creation of the solutions
7. I would like to continue to co-create in the future
8. I know more about the building now than before
9. It is easy to follow-up on the information provided by the service
Memo: Free text answer

10. What features of the solution did you find most innovative?
11. What features of the solution do you think could be improved?
12. Do you feel like you needed any prior technical knowledge to use the application?
13. Can you name a competitor which offer a similar solution to VICINITY and if so, which?
Memo: 1. Strongly agree, 2. Agree 3. Undecided 4. Disagree 5. Strongly disagree
Overall experience from VICINITY program
14. The participation in the VICINITY project was a positive experience for me
15. I would recommend the VICINITY services to others
16. VICINITY people supporting the services were helpful and provided me with assistance when needed
17. My feedback was taken into consideration
Memo: Yes or No answer, if yes -> Free text answer
18. Did you encounter any technical problems during the course of the experiment?
18.1 If yes, tell us what problem you encountered.
Memo: 1. Strongly agree, 2. Agree 3. Undecided 4. Disagree 5. Strongly disagree
Privacy / Personal Data usage
19. I trust the application and the data management
20. I feel confident that any data collected from the VICINITY IoT devices will not be shared with anyone
21. I know I can withdraw from the experiment whenever I want
User ID

Save a backup on your local computer (disable if you are using a public/shared computer)

A questionnaire assessing the Martim Longo´s Pilot application DEMO based on VICINITY solution.

Legend:

IoT - Internet of Things

The questionnaire is composed of 21 questions. Estimated time: 10-15 minutes.

Questions

Who am I?

- ☐ Technical user (infrastructure manager, building manager, engineer or technician)
- ☐ General user (teacher, nurse, caretaker and other members of staff)

Use of IoT Devices/Services

	Strongly agree	Agree	Undecided	Disagree	Strongly disagree
I found the VICINITY platform enabled IoT service a useful solution	○	○	○	○	○
The use of the VICINITY platform enabled IoT service contributed to improving building use conditions	○	○	○	○	○
The use of the VICINITY platform enabled IoT service contributed to improving resources consumption	○	○	○	○	○
Using the VICINITY platform enabled IoT service is easy	○	○	○	○	○
Learning how to use the application was easy	○	○	○	○	○
I enjoyed participating in co-creation of the solutions	○	○	○	○	○
I would like to continue to co-create in the future	○	○	○	○	○
I know more about the building now than before	○	○	○	○	○
It is easy to follow-up on the information provided by the service	○	○	○	○	○

What features of the solution did you find most innovative?

What features of the solution do you think could be improved?

Do you feel like you needed any prior technical knowledge to use the application?

Can you name a competitor which offers a similar solution to VICINITY and if so, which?

Figure 15 - 1st half of the online questionnaire for Main Users

Overall Experience of Participation in the VICINITY Project

	Strongly agree	Agree	Undecided	Disagree	Strongly disagree
The participation in the VICINITY project was a positive experience for me	◯	◯	◯	◯	◯
I would reccomend the VICINITY services to others	◯	◯	◯	◯	◯
The VICINITY people supporting the services were helpful and provided me with assistance when needed	◯	◯	◯	◯	◯
My feedback was taken into consideration	◯	◯	◯	◯	◯

Did you encounter any technical problems during the course of the experiment?

◯ Yes
◯ No

If yes, tell us what problem you encountered.

Privacy/Use of Personal Data

	Strongly agree	Agree	Undecided	Disagree	Strongly disagree
I trust the application and the data management	◯	◯	◯	◯	◯
I feel confident that any data collected from the VICINITY IoT Devices will not be shared with anyone	◯	◯	◯	◯	◯
I know I can withdraw from the experiment whenever I want	◯	◯	◯	◯	◯

(Optional) Would you like to share your name?

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Public

Submit

Figure 16 - 2nd half of the online questionnaire for Main Users

7.2.2. Potential Future Users

Questionnaire form distributed link:
https://ec.europa.eu/eusurvey/runner/VicinitySurveyPotentialUser

Table 12 - Questionnaire for Potential Users

VICINITY Program – Portuguese Pilot Case Questionnaire
Use Cases: ??
Memo: 1. Strongly agree, 2. Agree 3. Undecided 4. Disagree 5. Strongly disagree
VICINITY platform enabled IoT service
1. The VICINITY platform enabled IoT service is easy to integrate in the organization
2. The VICINITY platform enabled IoT service is easy to install and manage
3. The application is easy to understand and learn
4. The VICINITY platform enabled IoT service is a useful tool for individuals
5. The VICINITY platform enabled IoT service is a useful tool for organizations
6. I trust the application and data management
VICINITY platform enabled IoT service development
7. I'm interested in a co-creation of a solution
8. Are you interested in this solution for your organization?
Memo: Free text answer
9. Which features of the solution did you find most innovative?
10. Which features of the solution do you think could be improved?
11. Can you name a competitor which offers a similar solution to VICINITY and if so, which?
User ID

Vicinity enabled solutions DEMO of Value added services. Co-create with Enercoutim.

Legend:

IoT - Internet of Things

The questionnaire has 11 questions. Estimated time: 5-10 minutes.

Questions

Who am I?

- [ ] Technical user (building manager, engineer or technician)
- [ ] General user
- [ ] Systems buyer
- [ ] Other

VICINITY platform enabled IoT service

	Strongly agree	Agree	Undecided	Disagree	Strongly disagree
The VICINITY platform enabled IoT service is easy to integrate in the organization	○	○	○	○	○
The VICINITY platform enabled IoT service is easy to install and manage	○	○	○	○	○
The application is easy to understand and learn	○	○	○	○	○
The VICINITY platform enabled IoT service is a useful tool for individuals	○	○	○	○	○
The VICINITY platform enabled IoT service is a useful tool for organizations	○	○	○	○	○
I trust the application and data management	○	○	○	○	○

VICINITY platform enabled IoT service development

	Strongly agree	Agree	Undecided	Disagree	Strongly disagree
I'm interested in a co-creation of a solution	○	○	○	○	○
Are you interested in this solution for your organization?	○	○	○	○	○

Which features of this solution did you find most innovative?

Which features of the solution do you think could be improved?

Can you name a competitor which offers a similar solution to VICINITY and if so, which?

(Optional) Would you like to share your name?

Figure 17 - 1st Part of the online Questionnaire for Potential Users

Figure 18 - 2nd Part of the online Questionnaire for potential users

7.3. Additional Information on IEQ Reference Values

Optimal Indoor Environmental Quality (IEQ) Parameters:

	IEQ Parameters			
	Temperature (ºC)	Luminosity (lux)	CO2 (ppm)	Relative Humidity (%)
Optimal Conditions	**20 - 22**	300 (ambience) & **500-1000** (work area)	**400 - 800**	**35 - 60**
Legal Conditions	18 - 25	50 or 75	1250	25 - 75

Relevant information and stats:

IEQ Parameters	Temperature (ºC)	Average decrease in productivity per 1ºC increase over 22ºC	Decrease in productivity at 10ºC	Decrease in productivity at 32ºC
		2.4%	**14%**	**15%**
	Luminosity (lux)	Increase in productivity using higher illumination (750-1000 lux)		Comfort approval rate at 750 lux
		9%		**96%**
	CO2 (ppm)	Productivity comparing with a Green Environment (600ppm) in offices		School rooms with <1000 ppm in 2004 studies US
		1000ppm: **11-23%** lower	2500ppm: **44-94%** lower	**45-65%**
	Relative Humidity (%)	Studies shows that presence (even short-time periods) in **dry or humid air** environments (out of the 30-60% RH) can create the following symptoms: **colds**, **throat** and **eyes irritation**, **allergies** and **physical discomfort**		