



OPTIMISED ENERGY EFFICIENT DESIGN
PLATFORM FOR REFURBISHMENT
AT DISTRICT LEVEL

Optimised Energy Efficient Design Platform for Refurbishment at District Level
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D1.5: Requirements and specification of Graphical User Interfaces

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Abbreviations and Acronyms

Acronym	Description
BIM	Building Information Modelling
BPMN	Business Process Model and Notation
CityGML	City Geography Markup Language
DPI	District Performance Indicator
ECM	Energy Conservation Measure
GUI	Graphical User Interface
HTML	HyperText Markup Language
IFC	Industry Foundation Classes
IPC	Integrated Project Coordinator
IPD	Integrated Project Delivery
KML	Keyhole Markup Language
MEPS	Minimum Energy Performance Standard
OptEEmAL	Optimised Energy Efficient Design Platform for Refurbishment at District Level.
PDF	Portable Document Format
QOTF	Query On The Fly
TBB	Targets, Barriers and Boundaries
UC	Use Case
UI	User Interface
WFS	Web Features Service
WP	Work Package
XLS	Excel Files Extension

Executive Summary

The objective of OptEEmAL is to develop an Optimised Energy Efficient Design Platform for refurbishment at district level. The platform will deliver an optimised, integrated and systematic design based on an Integrated Project Delivery (IPD) approach for building and district retrofitting projects. This will be achieved through development of holistic and effective services platform that involves stakeholders at various stages of the design while assuring interoperability through an integrated ontology-based District Data Model.

This deliverable is the outcome of Task 1.4 “Definition of user interfaces: requirements definition and specification”. The aim of this task is to define the way the different users will interact with the OptEEmAL platform during the different steps of the design of a district retrofitting project. The work performed in this task and described in this deliverable is focused on how the information is introduced into the platform (input data formats and user interfaces) or presented to the user and the specification of the user capabilities according to the role performed in the refurbishment project (based on the IPD approach).

The deliverable starts describing the approach followed for the definition of the GUIs (Section 2). The process of defining the user interfaces is fed by the results achieved in the previous tasks of the project, where the roles of users and use cases to be implemented in the OptEEmAL platform have been identified [1]. From this information, Business Process Model and Notation (BPMN) diagrams are drawn for each use case and the processes detailed in each diagram, where each interaction between the user and the platform is detailed in text form and with mock-ups that visually define the appearance of the GUI of the OptEEmAL platform.

Section 3 presents a general overview of the platform GUIs. They have been thought of as a web/browser based solution. The interface will be developed using HTML5 and supported by a WebGL-based 3D visualization environment, which can be accessed both by PCs and mobile devices. The site map of the OptEEmAL GUI will include generic screens such as project overview or FAQ and those screens specific to the OptEEmAL Use Cases.

The IPD approach is present in all phases and tasks of the project and it needs to be specially taken into account when it comes to the interaction between the user and the platform. Section 4 describes the interpretation of the IPD specifications and their application into the platform from the point of view of the GUIs. It includes the justification of the different user profiles that will be present in the platform, as well as, how to ensure the early involvement of them. This section present, from the IPD point of view, who will be the users of the GUIs of the platform, which are their capabilities and skills and which are their requirements.

Section 5 is the core of the deliverable. This section presents the list of Use Cases which require user interaction. The final list of Use Cases is an adaptation of the list presented in deliverable D5.2 [2], according to the developments carried out in this direction during the last months of the project. A final list of 16 Use Cases that require user interaction was determined. Some of them are related only with input data processes, others are only related with output data processes, while others are connected to both processes (input and output). For each Use Case first a short description of the workflow is included as well as a BPMN diagram representing it visually. Workflows are focused on those processes which represent the interaction between the user and the platform. Several of the use cases require the participation of more than one user, interaction between users is also depicted when required. Each of the processes identified in the workflows is described in detail, identifying also the user(s), form of interaction and inputs and outputs. Then envisaged mock-ups of the GUIs for each process are presented. Finally the data formats for the inputs and outputs identified for each process is also described in a separate table.

1 Introduction

1.1 Purpose and target group

This report constitutes the Deliverable “D1.5 – Requirements and specification of Graphical User Interfaces”, the main outcome of Task “T1.4 – Definition of user interfaces: requirements definition and specification”.

The main objective of this document is to define the requirements and specification of the Graphical User Interfaces (GUIs) of the OptEEmAL platform. Following the work completed in previous tasks of WP1 as well as the use case definition performed in tasks of WP5, the aim of the work performed in this task is to define the way the different users will interact with the OptEEmAL platform. The work carried out in this task focuses on the specification of how the information is introduced into the platform (input data formats and user interfaces) and user capabilities according to the role performed in the refurbishment project (based on the IPD approach). Besides, the definition of the GUIs that will show the outputs provided by the platform has also resulted from carrying out this task, according to user needs and generated data.

The target group of the results and conclusions obtained as the effort carried out in this task and presented in this deliverable is mainly the developers of the OptEEmAL GUIs, to be carried out in Task 5.4. This task works in parallel with Task 1.5 in the definition of the outputs and the GUIs of the platform. All activities to be carried out for the integration of the platform (WP5) will take into consideration all the details defined in the use cases related to the interaction between the user and the OptEEmAL platform.

1.2 Contributions of partners

Table 1 depicts the main contributions from participant partners in the development of this deliverable.

Table 1: Contribution of partners

Participant short name	Contributions
TEC	<p>Task Leader. Responsible of the content of the deliverable.</p> <p>Main contributor of Section 1 (Introduction), Section 2 (GUI requirements definition approach) and Section 6 (Conclusions).</p> <p>Main contributor of the Definition of User Interfaces (Section 5) for the following Use Cases: UC1, UC3.1, UC7.1, UC7.2, UC9</p> <p>Implementation of the BPMN diagrams for workflow description for the definition of GUIs of each Use Case</p> <p>Description of UI processes for the definition of GUIs of each Use Case</p> <p>Identification of Input / Output data formats for the definition of GUIs of each Use Case</p>
CAR	<p>Main contributor of the Definition of User Interfaces (Section 5) for the following Use Cases: UC3.4 UC6, UC10, UC11, UC16</p> <p>Has provided review and contributions to all sections</p>
FUNITEC	<p>Contributor of the Definition of User Interfaces (Section 5) for the following Use Cases: UC3.2, UC3.3</p> <p>Has provided review and contributions to all sections</p>
TUC	<p>Contributor of the Definition of User Interfaces (Section 5) for the following Use Cases: UC3.2, UC3.3</p>

	Has provided review and contributions to all sections
ACC	Main contributor of Section 4 (User requirements and capabilities; IPD approach) Main contributor of the Definition of User Interfaces (Section 5) for the following Use Cases: UC2, UC17, UC20, UC21, UC22 Has provided review and contributions to all sections
ARG	Main contributor of Section 3 (OptEEmAL GUI Overview) Definition of GUI mock-ups for the definition of GUIs of each Use Case Has provided review and contributions to all sections

1.3 Relation to other activities in the project

The following table depicts the relationships of the work reported in this deliverable to other deliverables developed within the OptEEmAL project. These connections that should be taking into account while reading this document for further understanding of its contents.

Table 2: Relation to other activities in the project

Deliverable Number	Contributions
D1.1	E-guide on stakeholders involvement and IPD implementation for the design and execution
D1.2	Requirements and specification of input data process to evaluate users' objectives and current conditions
D1.3	Requirements and specification of geo-clustering data sets access module
D5.2	Functional architecture specification, interfaces definition and overall platform design
D1.6	Outputs definition: information and documentation resulting from the design
D5.3	Functional modules and interfaces development and testing

2 GUI Requirements definition approach

The main objective of task 1.4 “Definition of user interfaces: requirements definition and specification” is the definition of processes and formats for exchanging information between the OptEEmAL platform and the users of the platform. The purpose of this task is to define the communication in both directions, which means, the information that the user enters into the platform and the information that platform provides the user with in the different stages. In the data input process different data sources with different formats are introduced in the platform through specific user interfaces (e.g., upload file, remote access service). It will be also necessary to enter information provided directly by the user via forms or questionnaires. This information will be understood, processed and transformed by the internal processes of the OptEEmAL platform to deliver outputs to the user of the platform (the user can be the same that entered the input information or a different one). The output results are presented to the user in the form of reports or downloadable files for later use, or also through interactive graphs that allow real-time analysis of the results provided by the platform.

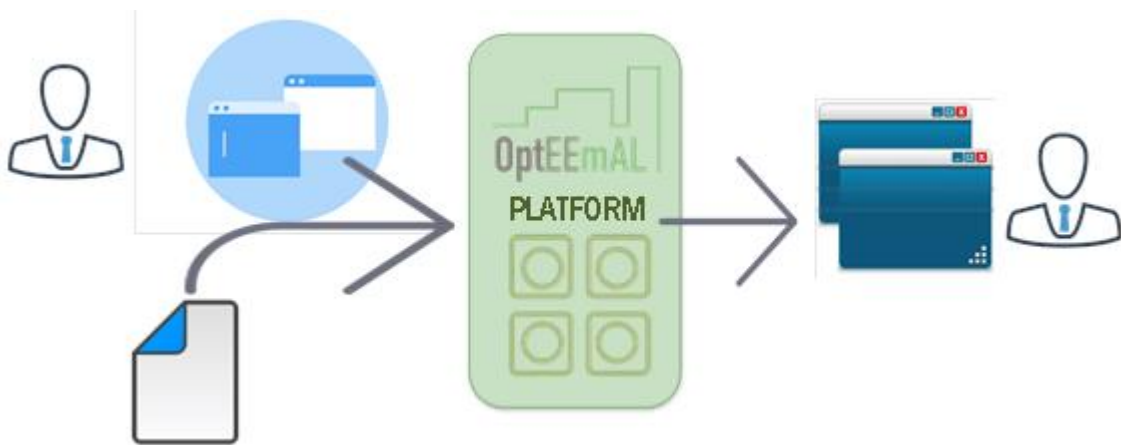


Figure 1: Objective of the definition of OptEEmAL user interfaces

The working methodology established for the identification of the requirements of Graphical User Interfaces (GUI) and the definition of them is presented in the figure below (Figure 2). The starting point for this definition is obtained as a result of the work done in previous tasks of the project; in particular, it is part of the identification of the stakeholders based on the IPD process of the project and the Use Cases that require user interaction. From both inputs, various sequence diagrams have been defined in D5.2 (“Functional architecture specification, interfaces definition and overall platform design”), for some of the main processes of the OptEEmAL platform. Some of these diagrams represent Use Cases relevant to this task. The process for the definition of the GUI is iterative for each identified Use Case. First, the workflow for the Use Case is defined. This workflow identifies the processes to be carried out between the user and the platform to successfully complete this Use Case. BPMN (Business Process Model and Notation) diagrams have been used to represent the workflow. Then, each of the identified processes is described in detail, indicating users, types of interaction, data input and output, among others. Finally, each process is detailed graphically through the generation of mock-ups that represent in a fairly approximate way the appearance of user interfaces for the user interaction with the OptEEmAL platform.

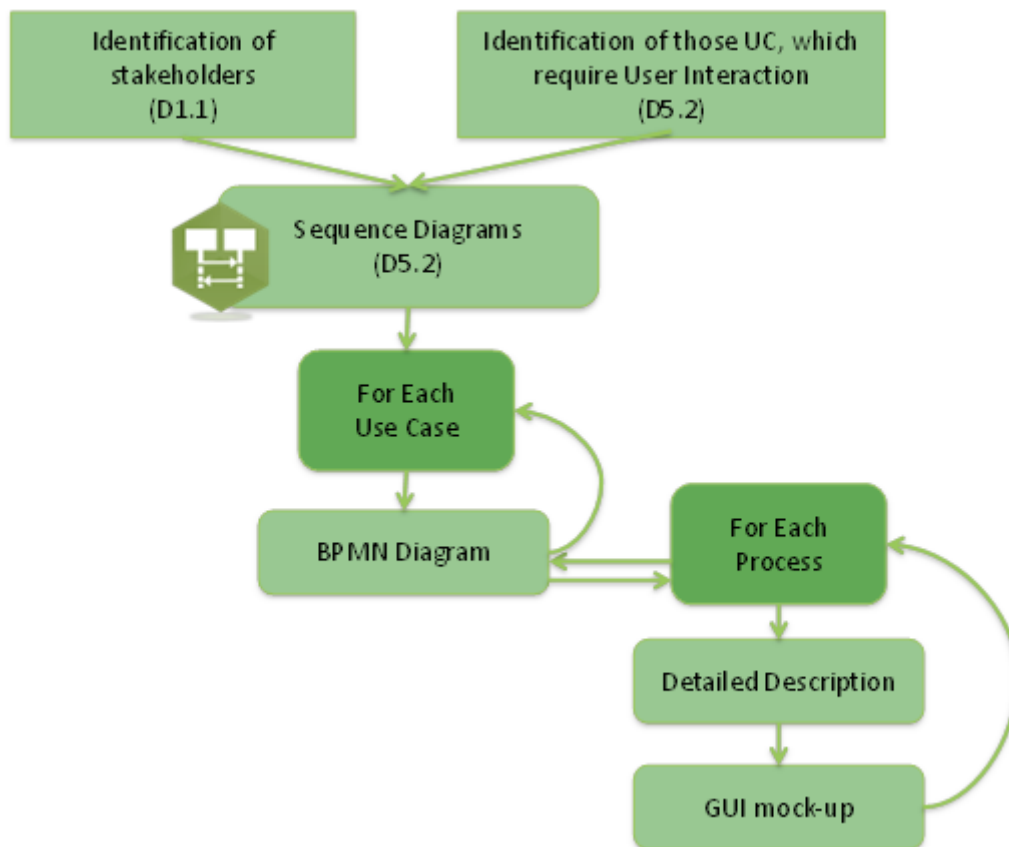


Figure 2: GUI definition process

3 OptEEmAL GUI Overview

The graphical user interface of OptEEmAL platform is planned to be a web/browser based solution, whose graphical user interface is envisioned to be developed using HTML5, supported by WebGL-based 3D visualization environment, which can be accessed both by PCs and mobile devices. Thus, the OptEEmAL platform web portal is planned to welcome the visitors with a visitor overview page (Figure 3 and Figure 68). This page is the initial page that any visitor sees upon visiting the web address of the platform in a web browser. It is envisioned to tell the visitors about the OptEEmAL platform and its capabilities, and latest news regarding the platform, along with a links for logging in or registering as a new user. A visitor who registers to the platform will be called a “user” from now on. Figure 4 through Figure 7 show the process and mock-ups for registration and logging in to the platform.

Upon logging in to the platform, the users will be welcomed with the platform dashboard page as in Figure 71. This page will summarize the users with what has been going on with the projects they have been in. From here, the users can go to the user account page, where they can edit their platform account details as in Figure 66, or to the Project Selection page (Figure 9), list their ongoing projects, along with the links to create a new project or delete an existing project (Figure 8). Help and guidance regarding project creation and platform usage will be provided to the users at appropriate steps along with a support page dedicated for helping the users regarding platform usage (Figure 67). The platform will provide the users with an e-mail-like messaging system for in-platform user intercommunication for a proper application of the IPD approach (Figure 69 and Figure 70). This system will inform the users about incoming messages and requests with proper warning signs, allowing them to do the pending actions requested from them by the platform or the other users involved in those projects.

The OptEEmAL platform makes use of the IPD approach, which requires that the project decisions be taken by the involvement of all users in a project, where each user undertakes appropriate roles as the Project Owner, the Prime Designer and the Prime Constructor. Thus, the IPD group members will be able to decide on the project’s needs and objectives and also provide the necessary information and data for the project through appropriate user interfaces. After gathering the necessary data from the users, such as CityGML, BIM files and contextual data, the platform will calculate and show the performance indicators for the baseline of the district to the users as in Figure 32. This is done in order to establish a baseline for the optimization phase and to let inform the users about the current condition of the district in terms of energy efficiency.

Following this step, the users will select appropriate targets, barriers and boundaries for their projects and check the computation strategies. Later, the user will command the platform to start the optimization phase. The optimization phase will mostly be a black-box process for the users, yet it will be shown the progress of the process in an appropriate manner to the user, such as displaying the time since the beginning of the phase, or a similar indicator. After the completion of the optimization phase, best results found based upon the user’s selected targets, barriers, boundaries and strategies will be shown to the users, which will be one or more of the most energy efficient solutions computed by the platform. The users will be able to select the data to export from the analysis results (Figure 57 through Figure 59) and export the results by saving the files generated by the OptEEmAL platform to their computers, or they will be able to go back to select different optimization criteria for the project and run consequent optimization phases.

Because the platform will require user interaction in different steps of the process, they will be able to log out from the platform whenever they want and login later and continue with the step they have completed.

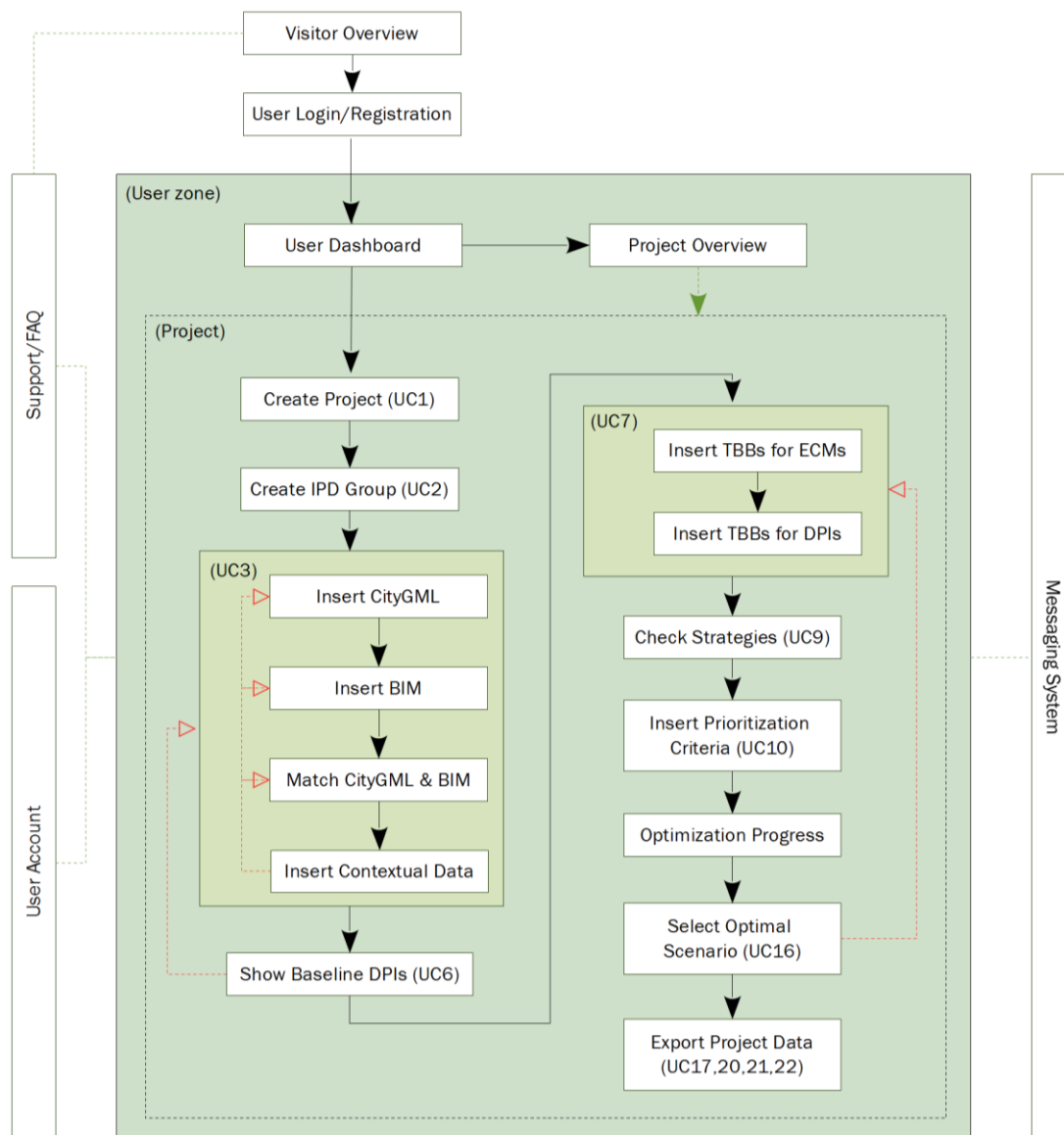


Figure 3: Site map of the OptEEmAL GUI based on the Use Cases

4 User requirements and capabilities; IPD approach

The IPD approach tries “to integrate people, systems, business structures and practices into a whole.” The official specification [3] establishes that this can be attained taking the following aspects into account:

- For teams; *“An integrated team entity composed key project stakeholders, assembled early in the process, open, collaborative.”*
- For processes; *“Concurrent and multi-level; early contributions of knowledge and expertise; information openly shared; stakeholder trust and respect”.*
- For risks; *“Collectively managed, appropriately shared”.*
- For compensations/rewards; *“Team success tied to the project success; value-based”.*
- For communications/technologies; *“digitally based, virtual; Building Information Modeling (3, 4 and 5 dimensional).”*
- For agreements; *“Encourage, foster, promote and support multi-lateral open sharing and collaboration; risk sharing”.*

For having a successful IPD approach in the OptEEmAL platform, at least the first two points should be met.

4.1 IPD interpretation for the OptEEmAL platform, stakeholders early involvement

The approach establishes clearly two points that are going to be tackled by the platform:

- The minimum set of users/roles for having an IPD team includes: Owner, Prime Designer and Prime Constructor.
- The users who play the three primary roles must be involved in the project from the early stages.

The two points are directly related with the decision of having three different (and necessary) user roles in the platform.

As it was already explained in D1.2 (“Requirements and specification of input data process to evaluate users’ objectives and current conditions”), it was detected that there will be situations in which one or more of the mandatory users could be missing. The IPD approach cannot be considered implemented unless the three interests are represented, therefore, in D1.2 a method for supplying any missing role was presented. However, this method does not have any implications from the software point of view so that it will not be included in this document.

Since the scope of the platform will be the design phase, it has been included in this report only the phases related to the design process, specifically in the detailed design as can be seen in Figure 4. In that figure it can be seen a comparison between the traditional working methods and what IPD proposes. From this comparison, the main points are that the stakeholders are earlier involved in the IPD approach and that this approach accomplishes more tasks during the design phase (for translating the efforts from the implementation phase to the design one).

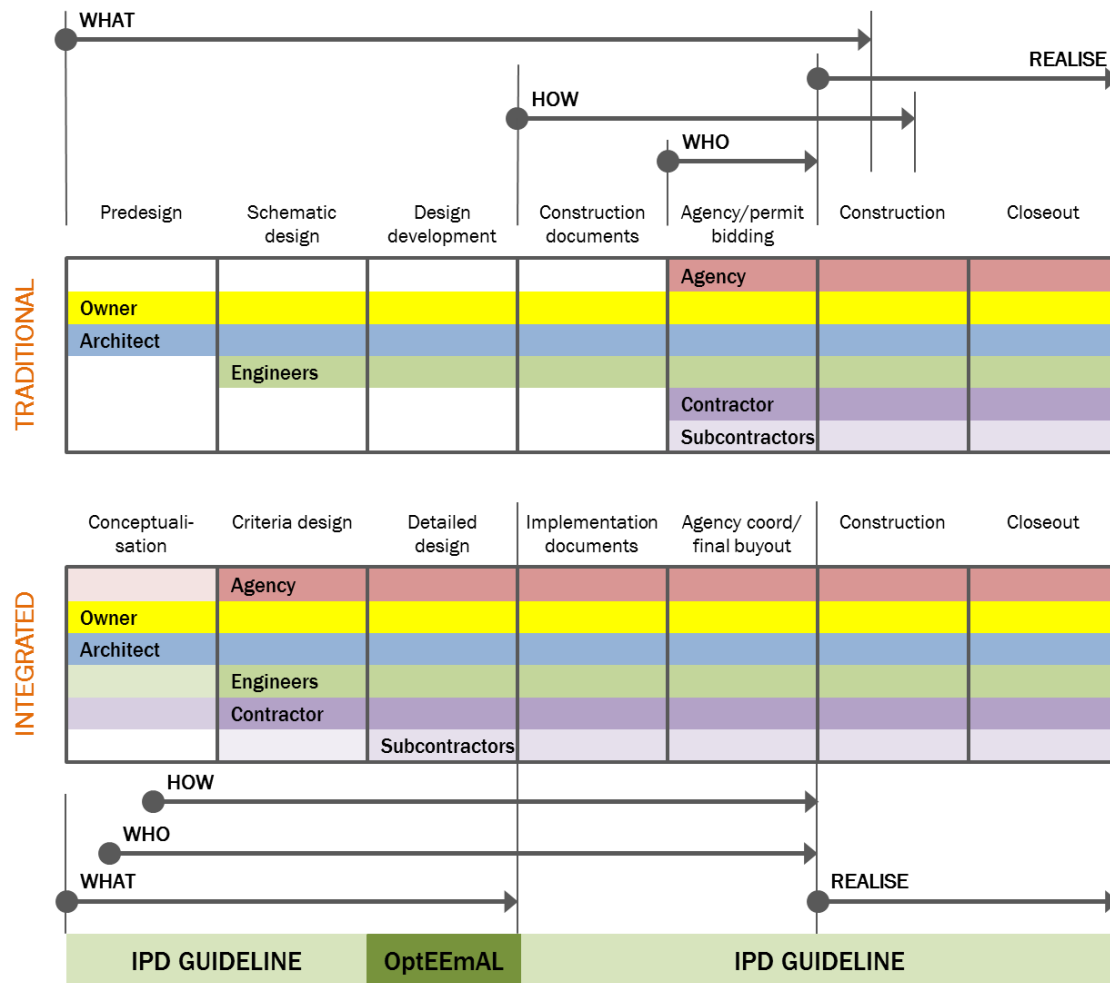


Figure 4: Scope and actors involvement in a traditional compared with an IPD approach

4.2 Users profiles; needs and capabilities

The environment in which the platform is going to develop its activity is the one before the implementation documents (also called construction documents). In this specific stage, it is expected more effort than in the traditional approach in order to translate the efforts where changes have the less economic impact. This platform will serve as a tool to adopt this effort increase in an efficient manner. One approach for doing it so, which is being followed by this platform, is to formalize the decisions making processes for ensuring that the decisions are made by consensus instead of only by a single user, the rationale to follow is that everything has to be approved by everyone.

4.2.1 The team as a whole

The IPD approach has the focus on the team. The main attitude to avoid is the “hunkering down” one in which every partners only look for its own interests and thus the participation of each actor is clearly separated in phases (i.e. In the design stage only the Designer will work). In the IPD guide this approach is described in this way:

“[...] integrated projects are uniquely distinguished by highly effective collaboration among the Owner, the prime designer and the prime constructor, commencing at early design and continuing through to project handover. [...]”[3]

Instead of the “hunkering down” attitude, the IPD approach seeks for the “huddling” one that will have common goals for every member of the team. To do so, it is mandatory to try to reach as much

consensus as possible, every member has to feel that the team goals are theirs and this can be accomplished using as much democracy as possible.. In the IPD guide it is reflected in this way:

“[...] Integrated Project Delivery is built on collaboration, which in turn is built on trust. Effectively structured, trust-based collaboration encourages parties to focus on project outcomes rather than their individual goals. Without trust-based collaboration, IPD will falter and participants will remain in the adverse and antagonistic relationships that plague the construction industry today. [...]”[3]

This issue is translated into the platform thanks to the mandatory steps related with the confirmation of all the decisions by all the users.

4.2.2 Owner

“[...] In IPD, the Owner takes on a substantially greater and more active role in evaluating and influencing design options. Additionally, the Owner is required to participate in establishing project metrics at an earlier stage than is typical in a traditional project. In light of the fluid operation IPD requires, the Owner will also be called on more often to assist in resolving issues that arise on the project. As member of the decision making body, the Owner will be involved on more project-related specifics and be required to act quickly in this regard to allow the project to continue efficiently. [...]”. [3]

Despite the scope of the platform is just the “Detailed Design” phase Figure 4, the team should be previously built up and the criteria design established. These aspects will be included into the platform, which are defined in UC1 (Create new project) and UC2 (Create new IPD group). Since these decisions have to be made by the Owner, the main actor for the UC1 and UC2, that will be depicted in the next section is the Owner.

In the specification of the IPD approach, it is also established that the Owner will have to:

- Provide decisions and guidance to all alternative options. This is ensured in the platform thanks to the consensus that is needed in all the decisions except in the creation of the team and the established objectives that will be done by the Owner.
- Approve the design prior to the implementation documentation phase, allowing the team to proceed with confidence. Beyond this fact, is the one that the Owner and the Constructor are actively involved in the design process so that the modifications in the implementation phase will be more difficult to justify.

4.2.3 Prime Designer

“[...] IPD relies heavily on an extensive and thorough design process that incorporates input and involvement of other team members, including constructors, during the design phase. [...]”[1]

To take the Prime Constructor and the Owner perspective into consideration, the Prime Designer will have to consult other stakeholders iteratively over the same designs. In the platform these iterations will be automated in a formal way so that it will not be possible to advance unless all the three primal points of view are in the design.

As in the Owner case, in the official specification it is said that the Designer will have to carry out the following tasks:

- To coordinate and integrate input from project stakeholders and ensure compliance with project requirements.
- To detail concept ideas into constructible form.
- To code compliance.

The platform should enable the Prime Designer to comply with the three points, especially the second one since the fact that the proposed solutions should be presented in an understandable and constructive manner is something in which the GUI will have a huge impact.

4.2.1 Prime Constructor

“[...] The integrated delivery process allows constructors to contribute their expertise in construction techniques early in the design process resulting in improved project quality and financial performance during the construction phase. The constructor’s participation during the design phase provides the opportunity for strong pre-construction planning, more timely and informed understanding of the design, anticipating and resolving design-related issues, visualizing construction sequencing prior to construction start, and improving cost control and budget management, all of which increase the likelihood that project goals, including schedule, life cycle costs, quality and sustainability, will be achieved.[...]” [3]

The Prime Constructor has to participate in the design process in order to ensure the feasibility of the proposed design. The final goal is to enrich the designs enough for not making necessary any modification of the project and thus, put the iterations in the design phase, not in the implementation one (in which the economic impact is much bigger).

Like the other two actors, the role that the Prime Constructor will play is more extensive than the he/she plays in traditional design projects. More precisely, the Constructor is expected to:

- Provide continuous cost feedback using information extracted from the model; all item quantities are based on quantity survey or lump sums provided by Trade Contractors and suppliers.
- Verify that cost is all-inclusive and accurate.
- Verify prefabrication decisions.
- Verify construction schedule.
- Finalize coordination of building systems, including MEPS.
- Verify tolerances.

All these requirements of a Constructor intervening in an IPD process are covered by the platform just ensuring the need for the Constructor approval in all the stages in the use of the platform. It will be also included means for ensuring that the information that the Constructor needs will be provided by the platform as can be check if we iterate over the specific DPIs.

4.3 Specific requirements related to IPD

4.3.1 Functional requirements

Next it is possible to find a list that explicitly states the functional requirements the platform will comply with.

Table 3: List of functional requirements

REQUIREMENT ID	DESCRIPTION
FR1	There will be three user profiles for using the platform: one Owner, one Designer and one Constructor.
FR2	A single user can play several of the roles that define the user profiles
FR3	The GUI has to be able to provide a clear way of representing the information that the platform will provide as exportable material in an understandable manner.
FR4	The GUI has to provide the means for making mandatory the consensus in all the decisions made in the platform (such as the geometrical representation of the district included in the system)

4.3.2 Non-functional requirements

Next will be explicated the non-functional requirements that will affect to the performance of the platform.

Table 4: List of non-functional requirements

REQUIREMENT ID	DESCRIPTION
NFR1	The GUI has to have the capability of running in any HTML5 compatible browser with the appropriate plug-ins.
NFR2	The GUI has to be able of running in computers with the performance expected in 2016.

5 Definition of User Interfaces

5.1 Introduction

The following table presents the list of Use Cases which requires user interaction. Each of the Use Cases will be detailed described in the following sections. The final list of Use Cases is an adaptation of the list presented in deliverable D5.2. The list has been adapted according to the updates carried out in the project during the last months as a continuous interaction between partners and actions performed in the active tasks of the project.

Table 5: List of Use Cases which require user interaction

Use case number	Use Case Name
INPUT DATA PROCESS	
UC1	Create new project
UC2	Create new IPD group
UC3.1	Insert CityGML
UC3.2	Insert BIM(s)
UC3.3	Match BIM(s) in CityGML
UC3.4	Insert Contextual data
UC6	Show DPIs
UC7.1	Insert Targets Boundaries and Barriers related to ECMs
UC7.2	Insert Targets and Boundaries related to DPIs
UC9	Check strategies
UC10	Insert prioritisation criteria
UC11	Show Defined Problem
EXPORTATION DATA PROCESS	
UC16	Select optimal scenario
UC17	Configure export data
UC20	Export project text data
UC21	Export project charts
UC22	Export project files

In addition to the Use Cases identified in the previous table, GUIs for other general screens of the platform will be detailed in the following section (Section 5.19). The relation between the general screens and the use cases has been shown on the site map of the OptEEmAL platform (Figure 3: Site map of the OptEEmAL GUI based on the Use Cases

).

5.2 UC1 Create New Project

This Use Case involves several processes oriented to the registration and authentication of the user(s), as well as the creation of a new project or the selection of an existing one.

5.2.1 Workflow

The workflow presented in the following figure (Figure 5) allows the Owner to log-in the system. If the user is not registered yet, it allows user registration. Once logged in, the user is able to create a new project or select an existing one. The first option (Create New Project) leads the user to UC2 (Create New IPD Group), the second one (Open Existing Project) leads the user to the point where the project was left in the last session (e.g. insert data, diagnosis, optimization, exportation).

Figure 5: UC1 Create New Project Workflow

5.2.2 Description of UI processes

5.2.2.1 Log-in

Table 6: Log-in process in UC1

Task Name	Log-in
Task type	Manual
User	Owner
Interaction	Form
Description	The Owner logs in the OptEEmAL platform
Input data	User credentials (username and password)

5.2.2.2 Register

Table 7: Register process in UC1

Task Name	Register
Task type	Manual
User	Owner
Interaction	Form
Description	If the user does not have an account in the platform a register form is shown. The Owner registers on the OptEEmAL platform as a new user.
Input data	Register dialog with required data for registration (i.e.name, e-mail, username, password)

5.2.2.3 Create New Project

Table 8: Create New Project process in UC1

Task Name	Create New Project
Task type	Manual
User	Owner
Interaction	Form
Description	The Owner creates a new project
Input data	Basic information of the new project to be created (project name, location and project short description)

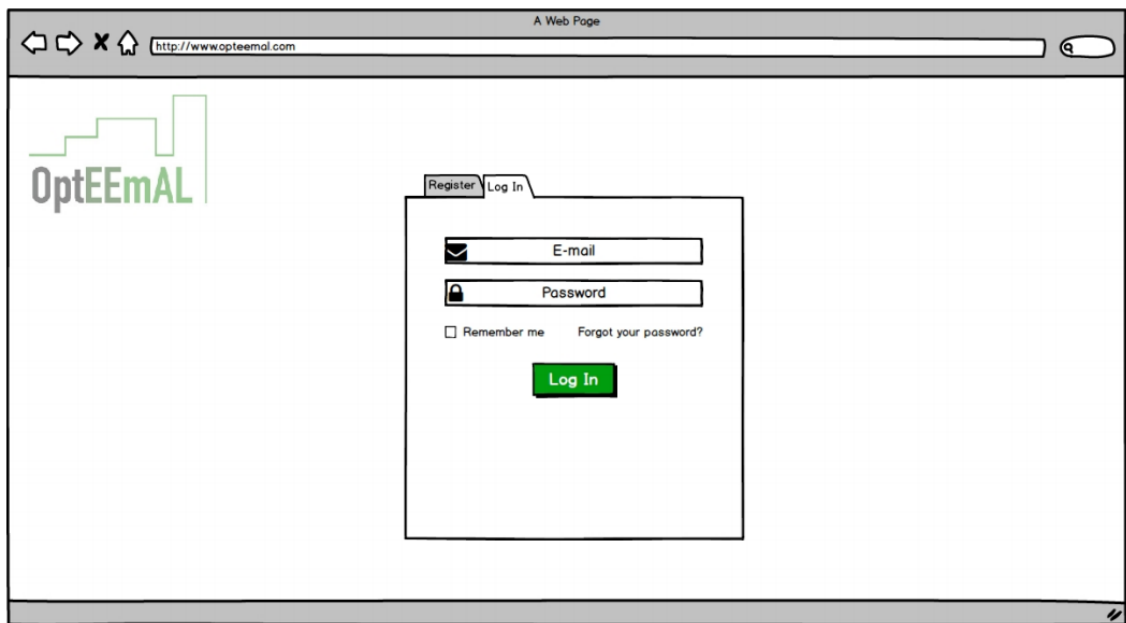
5.2.2.4 Open Existing Project

Table 9: Open Existing project in UC1

Task Name	Open Existing project
Task type	Manual
User	Owner
Interaction	Form
Description	The Owner selects an existing project from a predefined list, to which the user has access
Output data	List of available projects for the Owner with the name and the description of each project
Input data	Project name of the project selected

5.2.3 GUI Mock-ups

5.2.3.1 Log-in



A Web Page

http://www.opteemal.com

OptEEmAL

Register Log In

E-mail

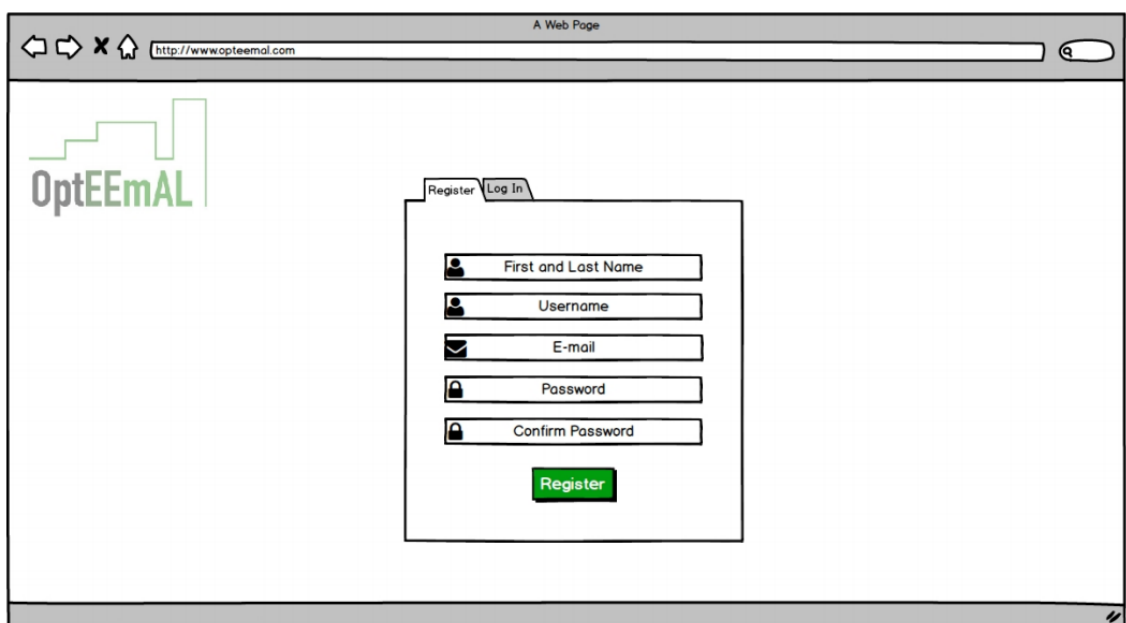
Password

☐ Remember me [Forgot your password?](#)

Log In

Figure 6: Log-in mock-up in UC1

5.2.3.2 Register



A Web Page

http://www.opteemal.com

OptEEmAL

Register Log In

First and Last Name

Username

E-mail

Password

Confirm Password

Register

Figure 7: Register mock-up in UC1

5.2.3.3 Create New Project

Figure 8: Create New project mock-up in UC1

5.2.3.4 Open Existing Project

Projects	Description	Creation Date	Last Update
Project 1	This is the one line project description...	21.10.2015	21.10.2016
Project 2	This is the one line project description...	21.10.2015	21.10.2016
Project 3	This is the one line project description...	21.10.2015	21.10.2016
Project 4	This is the one line project description...	21.10.2015	21.10.2016
Project 5	This is the one line project description...	21.10.2015	21.10.2016
Project 6	This is the one line project description...	21.10.2015	21.10.2016

Figure 9: Open Existing Project mock-up in UC1

5.2.4 Input / Output Data Formats

Table 10: Input / Output data formats in UC1

Process	Parameter	Data Format	Restrictions
Log-in	Username	Free text	Minimum length 4 characters.
	Password	Free text	Minimum length 8 characters.

Register	Name	Free text	Not null
	e-mail	Free text	It must include @ character
	Username	Free text	Minimum length 4 characters. Not repeated in the database
	Password	Free text	Minimum length 8 characters. Different to the username
Create New Project	Project Name	Free text	Not null
	Project Short Description	Free text	
Open Existing Project	Existing projects	List of projects	
	Project Name	Selection from a list	Not null

5.3 UC2 Create new IPD group

This Use Case involves different user profiles and requires the collaboration of all of them through the platform. The three profiles involved in this Use Case are: the Owner, the Prime Designer and the Prime Constructor.

5.3.1 Workflow

The workflow presented in the following figure shows the process for the creation of a new IPD group for the participation in a project previously created by the Owner. After the creation of the project, the Owner is informed about the IPD approach and the requirements to follow this approach, by showing the IPD e-Guide on the screen and it will be also accessible for the user to be downloaded. The first step to create the IPD group is to select a Prime Designer of the project. The project Owner is able to search the platform directory for the other project team members. If the proposed Prime Designer is not present in the platform directory, the Owner sends an invitation to the proposed user for platform registration. Communication with the proposed Prime Designer is performed through e-mail. If the proposed Prime Designer is not registered into the OptEEmAL platform, he/she must register first and then the IPD e-guide is shown. The Designer must accept or decline its suggested role in the project, in case he/she does not accept the role a new Prime Designer should be suggested by the Owner and the same process is repeated until a Prime Designer accepts the role. The same process applies to the Prime Constructor, which is suggested by the Owner. Once both, Prime Designer and Prime Constructor have accepted their role, the Owner starts with the insertion of the data of the project into the platform (UC3.1).

In case any of the members of the team is missing, the Integrated Project Coordinator figure could play the missing role, making the use of the platform by one single person that would play all the three roles possible. This role has the possibility of not being explicitly played by a physical user but for a virtual one. The only thing to take into account is to set the same person to the different roles.

Figure 10: UC2 Create New IPD Group Workflow

5.3.2 Description of UI processes

5.3.2.1 Show IPD e-Guide

Table 11: Show IPD e-guide process in UC2

Task Name	Show IPD e-guide
Task type	Automatic
User	Owner / Prime Designer / Prime Constructor
Interaction	Form / pdf
Description	IPD e-guide is shown to the user, as a previous step for the creation of the IPD group. First to the Owner and when joining the IPD team to the Prime Designer and Prime Constructor.
Output data	IPD e-guide

5.3.2.2 Create IPD group: Select Prime Designer & Constructor

Table 12: Select Prime Designer process in UC2

Task Name	Create IPD group: Select Prime Designer and Constructor
Task type	Manual
User	Owner
Interaction	Form
Description	The Owner proposes a Prime Designer and a Prime Constructor for the project.
Input data	E-mail address of the Prime Designer and Prime Constructor proposed or the Prime Designer and Prime Constructor name selectable from a drop-down list
Input data	Personalized message that is included in the invitation for joining the team.

5.3.2.3 Log-in

See Section 5.2.2.1, the user is the “Prime Designer” or the “Prime Constructor”

5.3.2.4 Register

See Section 0, the user is the “Prime Designer” or the “Prime Constructor”

5.3.2.5 Accept or Decline Role

Table 13: Accept or Decline Role process in UC2

Task Name	Accept or Decline Role
Task type	Manual

User	Prime Designer / Prime Constructor
Interaction	Form
Description	The Designer and Constructor proposed by the Owner need to accept or decline the proposal after analysing the existing information of the project and the IPD e-guide and provide a reason. This process could require additional communication between the Owner and the proposed roles external to the OptEEmAL platform.
Input data	Acceptance or rejection of the proposal

5.3.3 GUI Mock-ups

5.3.3.1 Show IPD e-Guide

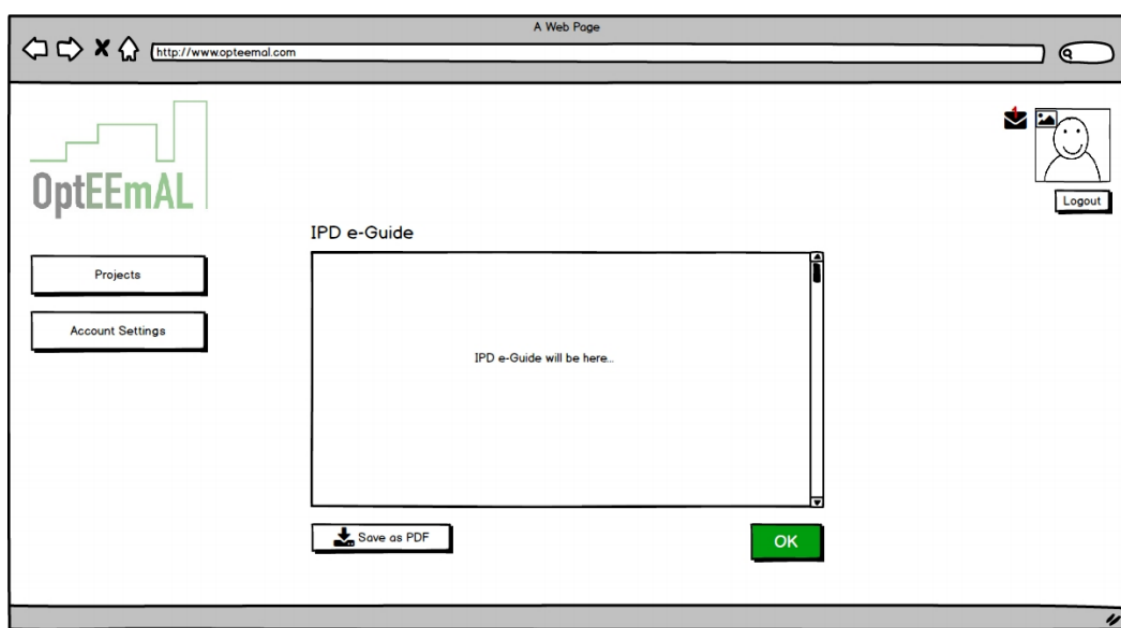


Figure 11 Show IPD e-Guide mock-up in UC2

5.3.3.2 Select Prime Designer and Prime Constructor

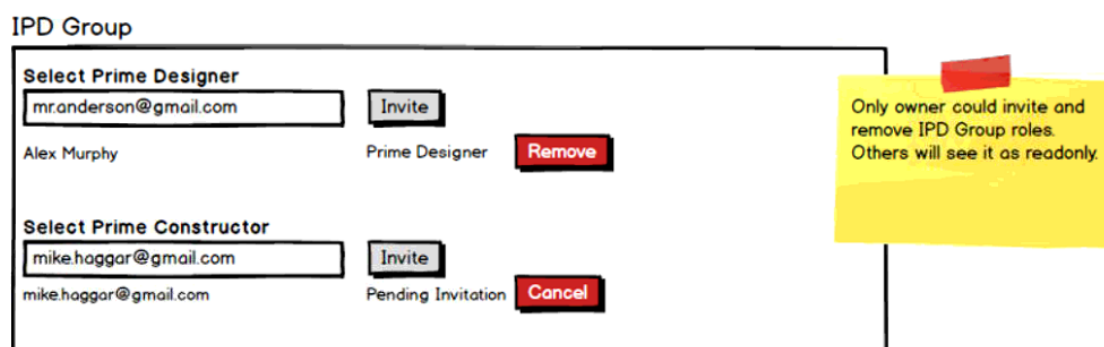


Figure 12: Select Prime Designer mock-up in UC2 (See 5.19.1 Project Overview mock-up for full size)

5.3.3.3 Log-In

See Figure 6: Log-in mock-up in UC1, the user is the “Prime Designer” or the “Prime Constructor”.

5.3.3.4 Register

See Figure 7: Register mock-up in UC1, the user is the “Prime Designer” or the “Prime Constructor”.

5.3.3.5 Accept or Decline Role

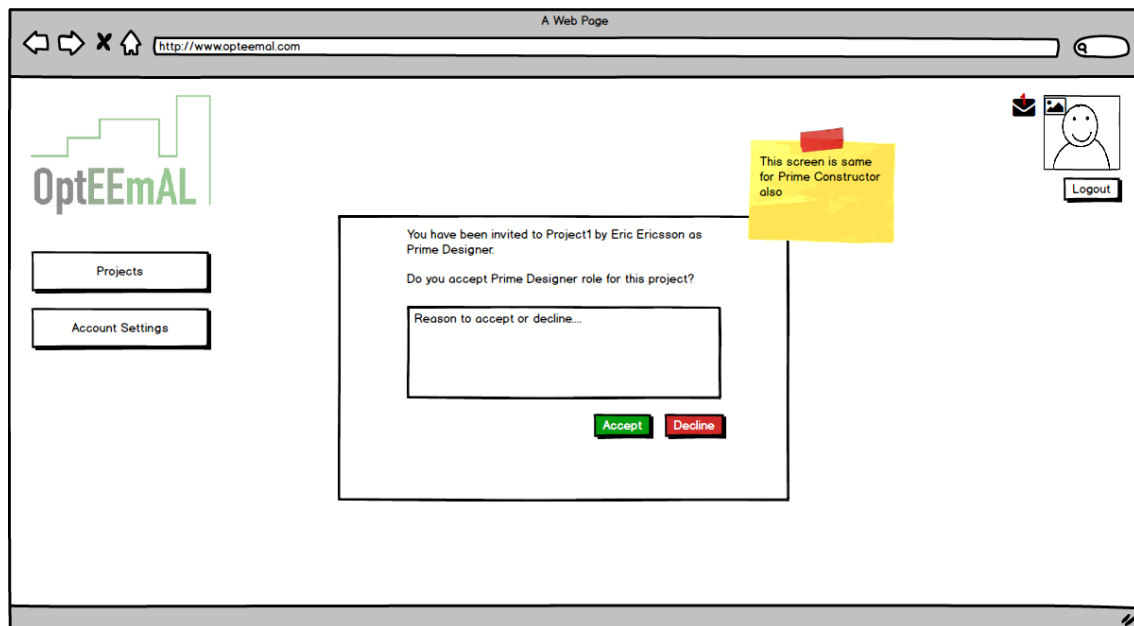


Figure 13: Accept or Decline Role mock-up in UC2

5.3.4 Input / Output Data Formats

Table 14: Input / Output Data Formats in UC2

Process	Parameter	Data Format	Restrictions
Show IPD e-guide	e-guide	PDF or HTML	
Select Prime Designer and Constructor	Prime Designer e-mail	Free text	It must include @ character
	Prime Designer Name	Selection from a list	
	Message for Prime Designer	Free text	Maximum length to be defined Optional
	Prime Constructor e-mail	Free text	It must include @ character
	Prime Constructor Name	Selection from a list	
	Message for Prime Constructor	Free text	Maximum length Optional
Accept or Decline Role	Acceptance	Yes/No	

5.4 UC3.1 Insert CityGML

This Use Case represents the processes required for the uploading and checking of a CityGML file which provides relevant information for the description of the environment of the refurbishment project.

5.4.1 Workflow

The workflow presented in the following figure (Figure 11) describes the process required for the uploading and validation of a CityGML file. The Prime Designer is the responsible user to perform this task. This process is triggered when a project and the IPD group have already been created. An existing CityGML file is uploaded into the OptEEemAL platform. The CityGML file is stored into the repository and also is exported into kml format in order to be properly visualized into a WebGL-based browser. The CityGML file needs to be checked according to the formulation, location correctness and completeness of the information contained in the uploaded file. Some of the tests perform an automatic validation of the base file (simple errors in schema validation); some others require user interaction and approval (geometry and location). In case the uploaded file passes all the defined tests, a database including all the information stored in the CityGML file is created, configured and completed according to the 3DCityDB implementation. A WFS is deployed for providing access to the features included in the database and the final version of CityGML and kml files are stored in the repository.

Figure 11: UC3.1 Insert CityGML

5.4.2 Description of UI processes

5.4.2.1 Upload Existing CityGML file

Table 15: Upload Existing CityGML file process in UC3.1

Task Name	Upload Existing CityGML file
Task type	Manual
User	Prime Designer
Interaction	Form
Description	User selects a file from a specified device and the file is uploaded into the OptEEemAL platform.
Input data	CityGML file with its path and name

5.4.2.2 Consistency Check of CityGML file

Table 16: Consistency Check process in UC3.1

Task Name	Consistency Check of CityGML file
Task type	Manual
User	Prime Designer
Interaction	3D View

Description	User visualizes the 3D model with the geometry of the CityGML file uploaded into the platform and decide whether the input file is correctly located or not. The 3D model is visualized on top of the aerial images provided by terrain geometry services (e.g. Google maps, Bing, openstreetmap). In case the model is not correctly located, a new CityGML file needs to be uploaded into the platform.
Output data	3D city Model and its Location (Longitude and latitude)

5.4.3 GUI Mock-ups

5.4.3.1 Upload Existing CityGML file

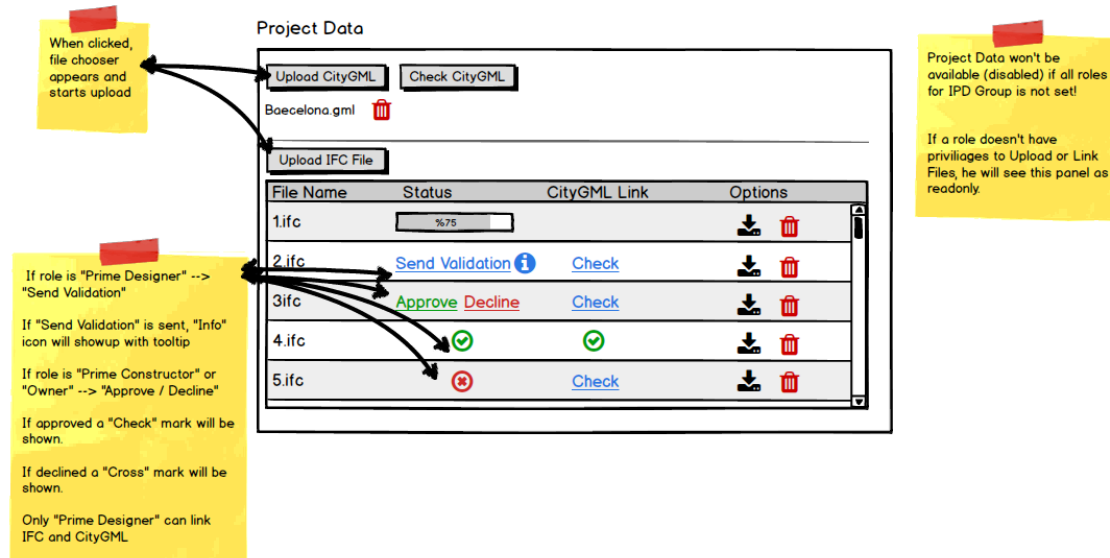


Figure 12: Upload Existing CityGML file in UC3.1 (See 5.19.1 for full size mock-up)

5.4.3.2 Consistency Check of CityGML file

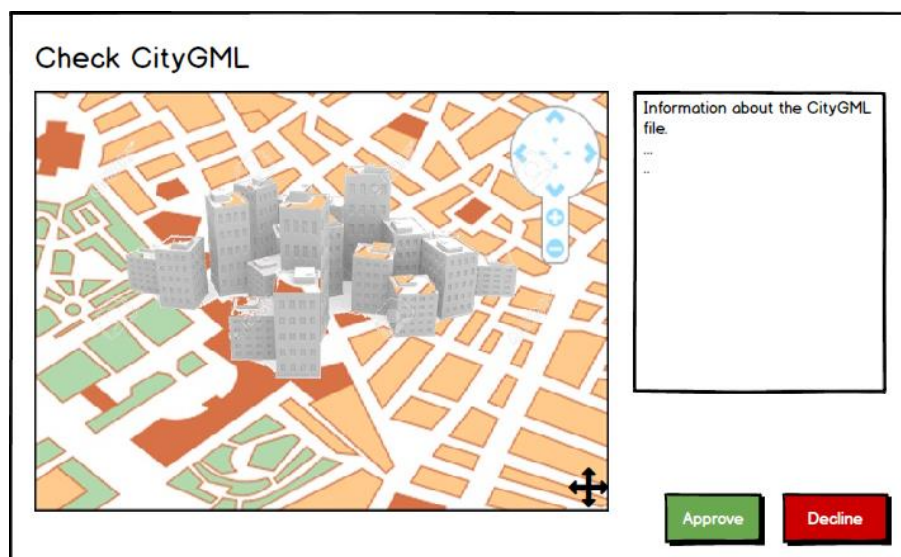


Figure 13: Consistency Check of CityGML file in UC3.1

5.4.4 Input / Output Data Formats

Table 17: Input / Output Data Formats in UC3.1

Process	Parameter	Data Format	Restrictions
Upload CityGML file	CityGML file path	String	
	CityGML file name	String	
	CityGML file	GML	
Consistency Check	Longitude	Degrees (float)	Between 0° and 360°
	Latitude	Degrees (float)	Between 0° and 360°
	3D City Model	KML	

5.5 UC3.2 Insert BIM(s)

The IFC data files inserted into the platform using the GUI should conform to certain data quality requirements before being stored in to platforms' BIM repository and used as input to the simulation model generation processes. This data validation process includes: (a) correctness, (b) completeness, and (c) CityGML consistency checks as is explained conceptually in the following sections.

5.5.1 Workflow

The workflow described in the following figure (Figure 14) describes the process required for uploading and validating an IFC file. The Prime Designer is the responsible user to perform this task. As illustrated in the BPMN diagram of Figure 14, the IFC file inserted by the Prime Designer passes initially a correctness check where an error detection process is implemented by an IFC error checking external tool. Four types of errors must be detected in the inserted IFC file, which include: clashes, space definition errors, surface orientation errors and incomplete shell errors. In case that the inserted IFC file has no errors, it can be passed on to the second completeness checking stage. In any other case the errors are communicated back to the user of the platform for correction. An error free IFC file is checked for completeness in the second completeness check stage. In this stage, the existence of four entities is checked, these entities are: Location, orientation, at least one Space entity and at least one Site entity. If only the location and orientation values are missing in the IFC file, the user is prompted via the OptEEmAL GUI to enter these values. In any other case, as well as if more values are missing then the user is prompted to insert a complete IFC file again. Models need to contain at least one space and at least one site and their respective geometric definitions. The next step is to check if it contains space boundaries and verify that they have been defined correctly. In case space boundaries do not exist or have been defined incorrectly, they are added or redefined through the CBIP tool [4] developed by TUC, one of the consortium partners. Finally the IFC file is converted into other formats required for interoperability with other modules and visualization (DAE, RDF). This process is repeated with all the IFC files inserted into the OptEEmAL platform.

Figure 14: UC3.2 Insert BIM(s)

5.5.2 Description of UI processes

5.5.2.1 Upload IFC file

Table 18: Upload IFC file process in UC3.2

Task Name	Upload IFC file
Task type	Manual
User	Prime Designer
Interaction	Form
Description	User selects a file from a specified device and path, then the file is uploaded into the OptEEemAL platform.
Input data	IFC file with its path and name

5.5.2.2 Correctness and Completeness Check

Table 19: Correctness and completeness check process in UC3.2

Task Name	Correctness and completeness check
Task type	Manual
User	Prime Designer
Interaction	Form
Description	The correctness and completeness checking process for the validation of the uploaded IFC file could require an external tool for the validation. The user should be informed to use these external tools or a link to the external tool in case the tool is accessible via web.

5.5.2.3 Determine Location and Orientation

Table 20: Determine location and orientation process in UC3.2

Task Name	Determine location and orientation
Task type	Manual
User	Prime Designer
Interaction	2D Map / Form
Description	The Prime Designer is asked to provide a correct location and orientation for the inserted IFC file. The insertion of such values could be done by interaction with a 2D map or by typing the values on the GUI.
Input data	Location and Orientation

5.5.3 GUI Mock-ups

5.5.3.1 Upload IFC File

See Figure 12: Upload Existing CityGML file in UC3.1 (See 5.19.1 for full size mock-up)

5.5.3.2 Correctness and Completeness Check

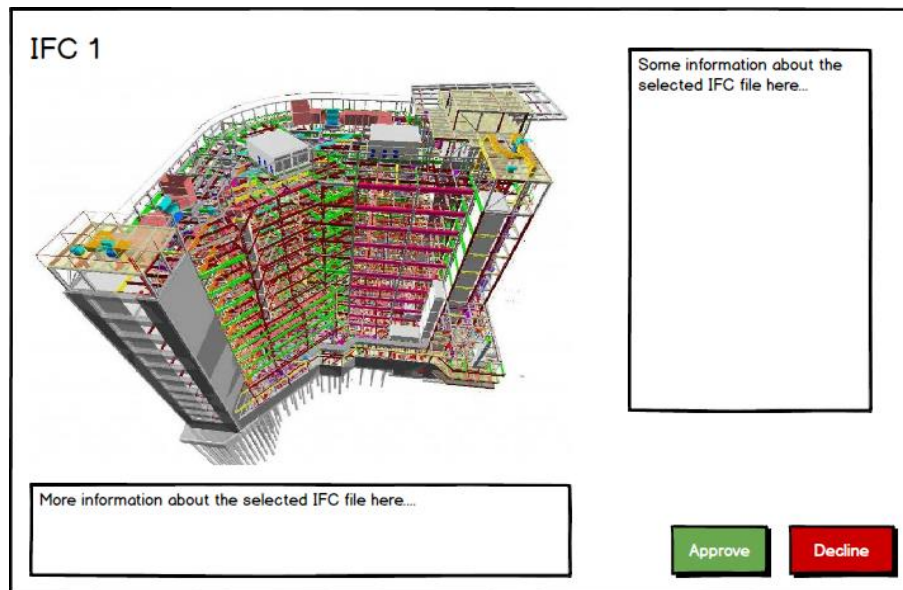


Figure 15: Correctness and Completeness check in UC3.2

5.5.3.3 Determine Location and Orientation

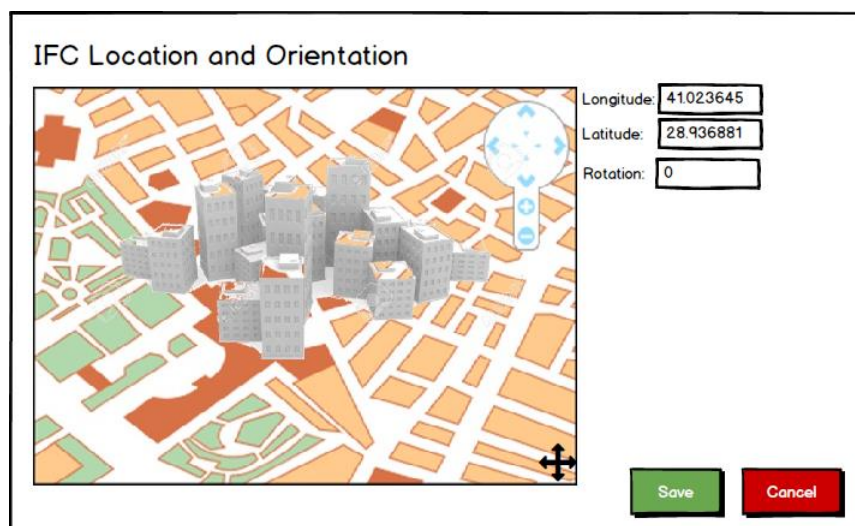


Figure 16: Determine Location and Orientation in UC3.2

5.5.4 Input / Output Data Formats

Table 21: Input / Output Data Formats in UC3.2

Process	Parameter	Data Format	Restrictions
Upload IFC file	IFC file path	String	
	IFC file name	String	
	IFC file	IFC	
Determine location and orientation	Location	Degrees	
	Orientation	Degrees	Minimum 0° Maximum 360°

5.6 UC3.3 Match BIM(s) in CityGML

5.6.1 Workflow

The workflow described in Figure 17 shows the process required for doing the matching between IFC and CityGML files. This task is performed by the Prime Designer. For the matching between files a 2D or 3D visualization of the district (CityGML) is proposed through a 2D/3D map. The task is performed for each BIM file uploaded into the platform. The matching includes the association of the BIM model and the building in the CityGML model and also the consistency checking of the uploaded BIM file with the geometry of the district (CityGML file).

The consistency between BIM and CityGML models consists of three checks which are performed using the platform's GUI:

1. Position check. The position of the building (described in the BIM model) is checked: whether it is accurately positioned in the district environment described by the CityGML data. This can be performed visually using the GUI by displaying both the CityGML building envelopes and the BIM model in the same screen.
2. Orientation check. The orientation of the BIM model with respect to the orientations of the building envelopes in the CityGML model is checked via the GUI. Orientation errors in the BIM model occur when the true north vector is not defined precisely. Such errors can be checked visually (GUI), and if exist, then they exist they should be communicated for correction.
3. Clash detection. The intersections (or clashes) of the BIM architectural elements with neighbour CityGML building envelopes should also be checked via the GUI. If a clash is detected it is communicated to the user of the platform for correction. The clashes which have relatively big volume can be detected visually and corrected by the user of the platform. Small volume clashes cannot be detected visually.

The association of the BIM model and the building(s) in the CityGML model vary if the BIM represents a single building in the district or if it represents a typology of buildings. The user must select the buildings or set of buildings in the 2D/3D map which is matched with a specific IFC file. The matchings are stored in the multiscale link database included in the OptEEmAL repository.

Figure 17: Match BIM(s) in CityGML

5.6.2 Description of UI processes

5.6.2.1 Verify Consistency Visually

Table 22: Verify consistency visually process in UC3.3

Task Name	Verify consistency visually
Task type	Manual
User	Prime Designer
Interaction	2D / 3D map
Description	District will be visualized in a 2D/3D map. 2D/3D representation of buildings in the district will be visualized on top of the aerial images provided by terrain geometry services (e.g. Google maps, Bing, Openstreetmap). The user will verify visually that the inserted IFC file is correctly positioned and oriented with respect to the surrounding building envelopes. This can be confirmed by displaying to the user both the IFC architectural elements with intense colours as well as all the surrounding CityGML building envelopes, with transparent colours in the same window. The user must verify whether the location and the orientation of the building described by the IFC file are correct but also that there are no clashes (intersections) with surrounding buildings.
Input data	Ok / Error

5.6.2.2 Specify New Location / Orientation

Table 23: Specify new location / orientation process in UC3.3

Task Name	Specify new location / orientation
Task type	Manual
User	Prime Designer
Interaction	2D Map / Form
Description	In case any type of inconsistency occurs, the Prime Designer is asked to specify new location and orientation via the GUI and the map generated by the CityGML file. The new location and orientation of the building should be checked again.
Input data	Location and Orientation

5.6.2.3 Match IFC with CityGML

Table 24: Match IFC with CityGML process in UC3.3

Task Name	Match IFC with CityGML
Task type	Manual
User	Prime Designer
Interaction	2D Map / Form
Description	The user is shown a match between the IFC file and the respective CityGML envelope performed by the platform and updates the confirmed Location (Longitude, Latitude and Elevation) and Orientation (True North vector) values in the IFC file.
Output data	Location and Orientation

5.6.3 GUI Mock-ups

5.6.3.1 Verify Consistency Visually

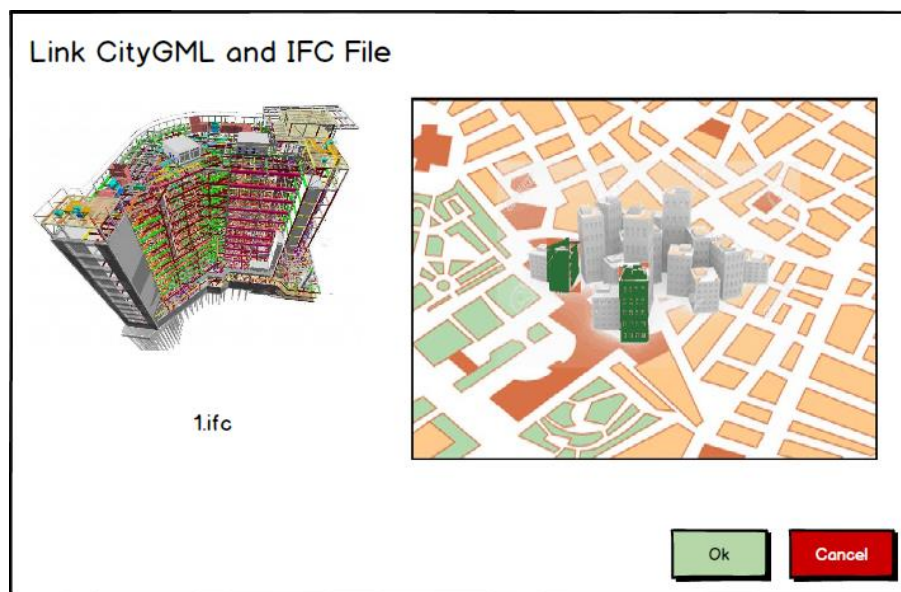


Figure 18: Display and Select Buildings in the District mock-up in UC3.3

5.6.3.2 Specify New Location / Orientation

See Figure 16: Determine Location and Orientation in UC3.2

5.6.3.3 Match IFC with CityGML

See Figure 18: Display and Select Buildings in the District mock-up in UC3.3

5.6.4 Input / Output Data Formats

Table 25: Input / Output Data Formats in UC3.3

Process	Parameter	Data Format	Restrictions
Verify consistency visually	OK	Yes / No	
Specify new location / orientation	Location	Number	
	Orientation	Number	Minimum 0° Maximum 360°
Match IFC with CityGML	Location	Number	
	Orientation	Number	Minimum 0° Maximum 360°

5.7 UC3.4 Insert Contextual data

5.7.1 Workflow

The workflow described in the following figures shows the process required for the insertion of contextual data into the OptEEmAL platform. The workflow is divided into two figures (Figure 19 and Figure 20) in order for it to be readable. This task is performed following an iterative process involving all users of the platform. Every partner is able to insert some type of contextual data, but in case some previously inserted value is going to be changed, the platform asks the original author to give his/her approval.

The task starts with the query of the geo-clustering data. The location of the case study is required first; either the name of the city or the geospatial coordinates (i.e. longitude and latitude). Together with the location information, the data from two different categories of geo-clustering data are needed: (1) Weather data and (2) Socio-economic data. These data are obtained from external geo-referenced data sources.

Afterwards the Owner is asked to assign a use to each building from the list of buildings involved in the retrofitting project. Then buildings and typologies are shown to the Owner and the other users (Prime Designer and Prime Constructor) are informed about the contextual data and the defined typologies. Both users check the data provided by the Owner and validate or modify the data obtained. When all users agree on the typologies and the contextual data received from the geo-clustering services, these data are validated and stored into the contextual repository.

For the definition of other contextual data, not provided by geo-clustering techniques, the inserted information is shown to the Prime Designer. If any information is missing he is the main responsible for introducing the missing data. For each building typology the Prime Designer has to complete information related to: (1) building elements and materials, (2) building energy systems, (3) district energy systems and (4) building schedules. The Prime Designer has completed each type of information. Then the other users (Owner and Prime Constructor) validate or provide comments regarding the information introduced by the Prime Designer. When all the users agree on the contextual information required for the implementation of the project, the information is validated and stored into the Context repository.

Figure 19: UC3.4 Insert Contextual Data (1 of 2)

Figure 20: UC3.4 Insert Contextual Data (2 of 2)

5.7.2 Description of UI processes

5.7.2.1 Query Geo-clustering Data

Table 26: Query geo-clustering data process in UC3.4

Task Name	Query Geo-clustering data
Task type	Manual
User	Owner
Interaction	Form
Description	The user, through a simple GUI, triggers the processes to access the contextual data available through geo-clustering techniques.
Input data	None

5.7.2.2 Check and Edit Contextual Data

Table 27: Check and edit contextual data process in UC3.4

Task Name	Check and edit contextual data
Task type	Manual
User	Owner / Prime Designer / Prime Constructor
Interaction	Form
Description	OptEEmAL GUI presents to the user in a structured manner the information collected by the geo-clustering services. The collected information is checked, edited, completed and finally validated by the users.
Input data	Data collected edited and completed
Output data	Data collected from geo-clustering services

5.7.2.3 Search for Unstructured Data

Table 28: Search for unstructured data process in UC3.4

Task Name	Search for unstructured data
Task type	Manual
User	Owner, Prime Designer and Prime Constructor
Interaction	Form
Description	The user is provided with a “search box” into the OptEEmAL GUI in order to search in the web for unstructured contextual data. Advanced searching functionalities for filtering and fine tuning is provided to quickly find useful information for completing the contextual data required in the refurbishment project.
Input data	Searching words
Output data	Results of the search

5.7.2.4 Assign a Use to Each Building

Table 29: Assign a use to each building in UC3.4

Task Name	Assign a use to each building
Task type	Manual
User	Owner
Interaction	Form
Description	The Owner is presented with CityGML and IFC matched information and is asked to

	assign a use for each building from a list
Input data	Building Use
Output data	List of buildings assigned to each use

5.7.2.5 Show Buildings and Typologies

Table 30: Show buildings and typologies in UC3.4

Task Name	Show buildings and typologies
Task type	Manual
User	Owner
Interaction	Form
Description	According to building geometry, orientation and use, a table with all buildings and their corresponding typologies to be used in simulation is presented to the user (Owner).
Output data	List of buildings and typologies

5.7.2.6 Send Contextual Data and Building Typologies for Comments

Table 31: Send contextual data and building typologies for comments in UC3.4

Task Name	Send contextual data and building typologies for comments
Task type	Manual
User	Owner
Interaction	Form
Description	When contextual data and building typologies have been selected by the Owner, he / she requests other technical users (Prime Designer and Prime Constructor) to check the contextual data collected from geo-clustering techniques as well as defined typologies
Input data	Request
Output data	Contextual data and Building typologies

5.7.2.7 Implement Suggestions, Validate and Store

Table 32: Implement suggestions, validate and store in UC3.4

Task Name	Implement suggestions, validate and store
Task type	Manual
User	Owner

Interaction	Form
Description	Suggestions, comments and validations sent by other users (Designer and Constructor) are collected by the Owner and the corresponding actions are carried out in order to implement the suggestions provided by others. When the comments and suggestions are taken into account, final values are stored into the repositories.
Output data	Suggestions, comments and modifications provided by other users

5.7.2.8 Check and Add Comments

Table 33: Implement suggestions, validate and store in UC3.4

Task Name	Check and add comments
Task type	Manual
User	Prime Designer and Prime Constructor
Interaction	Form
Description	The user selects the contextual data and the set of typologies, which have not been correctly identified or applied according to their criteria and proposes new ones, or provides feedback for the Owner. Comments to the contextual data and typologies proposed by the Owner are stored into the project repository.
Input data	Comments
Output data	Contextual data and Building typologies defined by the Owner.

5.7.2.9 Show a Summary of Inserted Information

Table 34: Show a summary of inserted information in UC3.4

Task Name	Show a summary of inserted information
Task type	Manual
User	Prime Designer
Interaction	Form
Description	User (Prime Designer) is presented with a summary of inserted information: IFCs, data contained, contextual data and typologies. He / She validates the information shown or identifies that complementary information is required for the proper implementation of the project.
Input data	Validate
Output data	Summary of inserted information

5.7.2.10 Select Typology and Provide Complementary Information

Table 35: Select typology and provide complementary information in UC3.4

Task Name	Select typology and provide complementary information
Task type	Manual
User	Prime Designer
Interaction	Form
Description	User selects a typology and the type of complementary information required to be completed (Building elements/material, Building energy systems, District energy systems or Building schedules)
Input data	Selected typology and type of information required to be completed
Output data	List of typologies and types of information to complete

5.7.2.11 Introduce Information about Building Elements / Materials

Table 36: Introduce information about building elements / materials in UC3.4

Task Name	Introduce information about building elements / materials
Task type	Manual
User	Prime Designer
Interaction	Form + 3D visualization
Description	User is presented with a catalogue of building elements to choose from and the 3D representation of the selected typology. User selects a building element in 3D model from selected typology and matches it with a corresponding element from the list.
Input data	Selected element from the typology and selected element from the list
Output data	List of building elements assigned to each typology

5.7.2.12 Introduce Information about Building Energy Systems

Table 37: Introduce information about building energy systems in UC3.4

Task Name	Introduce information about building energy systems
Task type	Manual
User	Prime Designer
Interaction	Form + 3D visualization
Description	User is presented with a catalogue of energy systems to choose from and the 3D representation of the selected typology. User assigns one or more energy systems to each typology.
Input data	Selected typology and selected energy system from the list

Output data	List of energy systems assigned to each typology
--------------------	--

5.7.2.13 Introduce Information about District Energy Systems

Table 38: Introduce information about district energy systems in UC3.4

Task Name	Introduce information about district energy systems
Task type	Manual
User	Prime Designer
Interaction	Form + 3D visualization
Description	User is presented with a catalogue of energy systems at district level to choose from. User assigns one or more energy systems to each typology and selects the other typologies to which these systems are connected.
Input data	Selected typology, selected energy system at district level from the list and the list of other typologies to which are connected
Output data	List of district energy systems assigned to each typology

5.7.2.14 Introduce Information about Building Schedules

Table 39: Introduce information about building schedules in UC3.4

Task Name	Introduce information about building schedules
Task type	Manual
User	Prime Designer
Interaction	Form
Description	User is presented with a list of schedules to choose from. User assigns a schedule to the building typology or validates the predefined one.
Input data	Selected typology and selected schedule
Output data	List of schedules assigned to each typology

5.7.2.15 Validate or Write Justification and Store

Table 40: Validate or write justification and store in UC3.4

Task Name	Validate or write justification and store
Task type	Manual
User	Prime Designer
Interaction	Form

Description	User is presented with a summary of the information selected to define the retrofitting project and validates the information, then the data are stored into the repositories. If any of the comments or suggestions proposed by other users are not taken into consideration the justification is also be provided and stored into the repository.
Input data	Validation or Justification
Output data	Summary of Information

5.7.3 GUI Mock-ups

5.7.3.1 Query Geo-clustering Data

Contextual Data

Query Geo-clustering Data ✓ Queried ↻ Re-Query

Check and Edit Contextual Data

Search Unstructured Data

Assign Use to Buildings

Buildings and Typologies

Request Validation ℹ Validation sent. P. Designer P. Constructor Owner

Alex Murphy (Prime Designer)

Provide Complementary Info

Building Elements / Materials Building Energy Systems ✗ Not Validated

District Energy Systems Building Schedules Justification

"Building and Typologies" becomes available to other users after Owner requests validation

Figure 21: Contextual Data Panel in UC3.4

5.7.3.2 Check and Edit Contextual Data

Contextual Data

Location: City 1, (39.933363, 32.859742)

Weather Data

Unit	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Average temperature	°C	2010	20	21	22	23	24	25	26	27	26	25	24
Average high temp.	°C	2010	20	21	22	23	24	25	26	27	26	25	24
Average low temp.	°C	2010	20	21	22	23	24	25	26	27	26	25	24
Highest temperature	°C	2010	20	21	22	23	24	25	26	27	26	25	24
Lowest temperature	°C	2010	20	21	22	23	24	25	26	27	26	25	24

Socio-Economic Data

Year	Population	Electricity Consumption	Insolation Performance	...
2010	13000	15 Mwh	3Kwh	...
2011	13500	16 Mwh	3Kwh	...
2012	13750	17 Mwh	3Kwh	...
2013	14000	18 Mwh	3Kwh	...
2014	14500	19 Mwh	3Kwh	...

Orwell George (Owner) = ✓ Approved

Alex Murphy (Prime Designer) = ✗ Declined

Mike Haggard (Prime Constructor) = Approve Decline

OK

Information parts can be edited by users.

Users can only approve or decline their own state.

Each user will see others' approve states.

Figure 22: Check and Edit Contextual Data in UC3.4

5.7.3.3 Search for Unstructured Data

Search for Unstructured Data

Enter search keyword...

Search

Settings

OK

Figure 23: Search for Unstructured Data in UC3.4

5.7.3.4 Assign a Use to Each Building

Assign Use to Each Building

Matched IFCs	Building Use
IFC1	Use1
IFC2	Use2
IFC3	Use3
IFC4	Use4
IFC5	Use5
IFC6	Use6

Add

IFC	Building Use	
IFC1	Use2	
IFC2	Use5	

Ok

Figure 24: Assign a Use to Each Building in UC3.4

5.7.3.5 Show Buildings and Typologies

Show Buildings and Typologies	
Buildings	Typologies
Building 1	Typology 1
Building 2	Typology 2
Building 3	Typology 2
Building 4	Typology 2
Building 5	Typology 2
Building 6	Typology 1
Building 7	Typology 1
Building 8	Typology 1
Building 9	Typology 3
Building 10	Typology 3

Ok

Figure 25: Show Buildings and Typologies in UC3.4

5.7.3.6 Send Contextual Data and Building Typologies for Comments

See Figure 21: Contextual Data Panel in UC3.4

5.7.3.7 Implement Suggestions, Validate and Store

See Figure 21: Contextual Data Panel in UC3.4

5.7.3.8 Check and Add Comments

See Figure 21: Contextual Data Panel in UC3.4

5.7.3.9 Show a Summary of Inserted Information

See Figure 21: Contextual Data Panel in UC3.4

5.7.3.10 Select Typology and Provide Complementary Information

Provide Complementary Information

Typologies	Information Type
Typology 1	Elements / Material
Typology 2	Energy Systems
Typology 3	District Energy Systems
Typology 4	Schedules
Typology 5	

Add

Typologies	Information Type	
Typology 1	Elements / Material	
Typology 2	Schedules	
Typology 2	District Energy Systems	
Typology 3	Energy Systems	
Typology 5	Elements / Material	

Ok

Figure 26: Provide Complementary Information in UC3.4

5.7.3.11 Introduce Information about Building Elements / Materials

Building Elements / Materials

Typologies	Building Elements / Materials
Typology 1	Element 1
Typology 2	Element 2
Typology 3	Element 3
Typology 4	Element 4

Add

Typologies	Building Elements / Materials	
Typology 1	Element 2	
Typology 2	Element 1	
Typology 3	Element 1	
Typology 4	Element 4	

Ok

Figure 27: Building Elements / Materials in UC3.4

5.7.3.12 Introduce Information about Building Energy Systems

Building Energy Systems

Typologies

- Typology 1
- Typology 2
- Typology 3

Building Energy Systems

- Energy System 1
- Energy System 2
- Energy System 3
- Energy System 4
- Energy System 5

Add

Typologies	Building Energy Systems
Typology 1	Energy System 2
Typology 2	Energy System 3
Typology 3	Energy System 1
Typology 4	Energy System 2

Ok

Figure 28: Building Energy Systems in UC3.4

5.7.3.13 Introduce Information about District Energy Systems

District Energy Systems

Typologies

- Typology 1
- Typology 2
- Typology 3

Energy Systems

- Energy System 1
- Energy System 2
- Energy System 3
- Energy System 4
- Energy System 5

Add

Typologies	Energy Systems	Connected Typologies
Typology 1	Schedule 2	Typology 2
Typology 2	Schedule 3	Typology 3
Typology 3	Schedule 1	Typology 4
Typology 4	Schedule 2	Typology 2, Typology 3, Typology 4

Ok

"Connected Typologies" is a multi selection list.

Figure 29: District Energy Systems in UC3.4

5.7.3.14 Introduce Information about Building Schedules

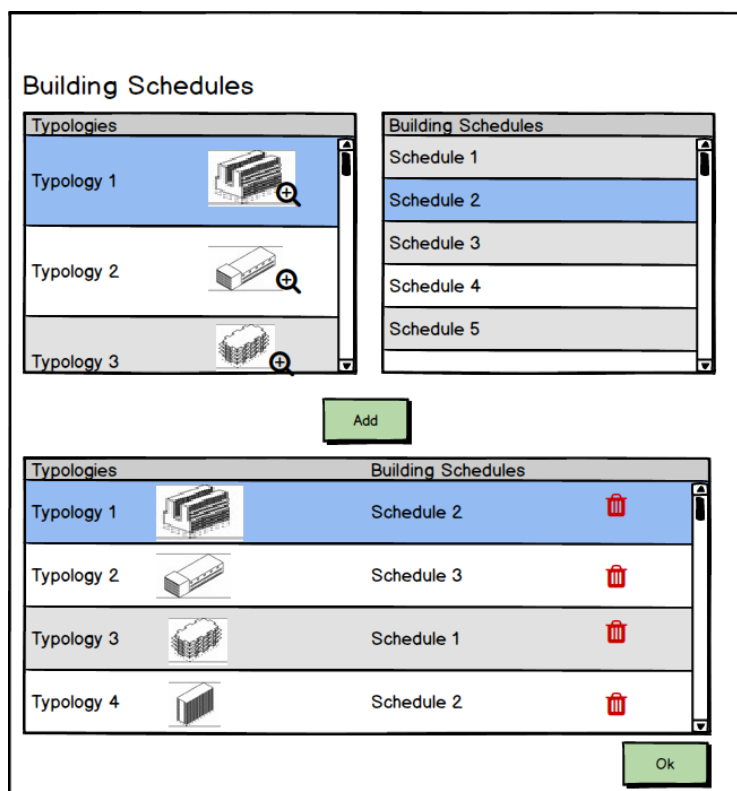


Figure 30: District Energy Systems in UC3.4

5.7.3.15 Validate or Write Justification and Store

See Figure 21: Contextual Data Panel in UC3.4

5.7.4 Input / Output Data Formats

Table 41: Input / Output Data Formats in UC3.4

Process	Parameter	Data Format	Restrictions
Check and Edit Contextual Data	Data collected from geo-clustering services	.epw	
	Required data from geoclustering services		
Search for unstructured data	Searching words	Free text	Maximum length to be defined
	Search results	HTML	
Assign a Use to Each Building	Building Use	<Selection from a list>	
	List of buildings	List of <predefined list>	
Show Buildings and Typologies	List of buildings and typologies	List of <predefined list>	
Send Contextual	Request	Yes / No	

Data and Building Typologies for Comments	Contextual data		
	Building typologies	List of <predefined list>	
Implement Suggestions, Validate and Store	Suggestions, comments and modifications	Free text	Maximum length to be defined
Check and Add Comments	Comments	Free text	Maximum length to be defined
	Contextual data		
	Building typologies	List of <predefined list>	
Show a Summary of Inserted Information	Validate	Yes / No	
	Summary of inserted information	Various	
Select Typology and Provide Complementary Information	Typology	<Selection from a list>	
	Type of information required	<Selection from a list>	
	List of typologies	List of <predefined list>	
Introduce Information about Building Elements / Materials	Building element	<Selection from a list>	
	Typology	<Selection from a list>	
	List of building elements	List of <predefined list>	
Introduce Information about Building Energy Systems	Building energy system	<Selection from a list>	
	Typology	<Selection from a list>	
	List of building energy systems	List of <predefined list>	
Introduce Information about District Energy Systems	District energy system	<Selection from a list>	
	Typology	<Selection from a list>	
	List of district energy systems	List of <predefined list>	
Introduce Information about Building Schedules	Building schedules	<Selection from a list>	
	Typology	<Selection from a list>	
	List of schedules	List of <predefined list>	
Validate or Write Justification and Store	Validate	Yes / No	
	Summary of Information	Various	

5.8 UC6 Show DPis

5.8.1 Workflow

The workflow described in the following figure shows the process required for presenting the user the results of the diagnosis DPis. All the users should have access to the results of the Diagnosis DPis. This task consists mainly on the presentation of the DPis resulting from the diagnosis of the current state of the retrofitting district. After the completion of the task the user is requested to provide the list of configuration parameters (TBBs, strategies and prioritization criteria) for the retrofitting project (UC7). The DPis should be available during the following tasks: insertion of targets, boundaries and barriers, checking of the strategies and insertion of the prioritization criteria.

Figure 31: UC6 Show DPis

5.8.2 Description of UI processes

5.8.2.1 Show Diagnosis DPis

Table 42: Show Diagnosis DPis in UC6

Task Name	Show diagnosis DPis
Task type	Manual
User	Owner / Prime Designer / Primer Constructor
Interaction	Graphs + 2D Map
Description	OptEEmAL platform shows to the user the result of the diagnosis of the current state for the retrofitting project. Diagnosis DPis are shown at district level, however, some DPis could be shown at building level.
Output data	Diagnosis DPis and results for each DPI

5.8.3 GUI Mock-ups

5.8.3.1 Show Diagnosis DPis

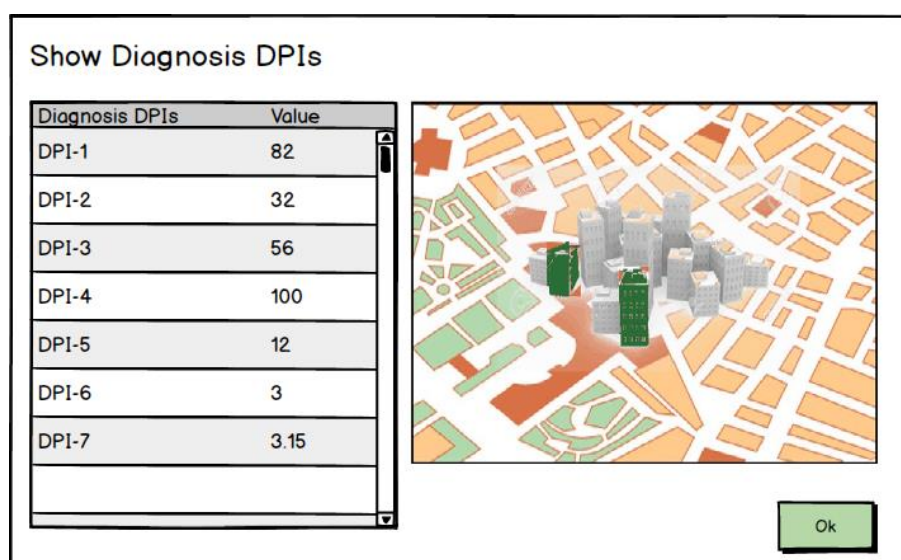


Figure 32: Show diagnosis DPLs mock-up in UC6

5.8.4 Input / Output Data Formats

Table 43: Input / Output Data Formats in UC6

Process	Parameter	Data Format	Restrictions
Show diagnosis DPLs	Diagnosis DPLs	List of <Selection from a list>	None
	DPLs results	List of <numeric value>	None

5.9 UC7.1 Insert Targets, Boundaries and Barriers related to ECMs

5.9.1 Workflow

The workflow described in the following figure shows the process required for the identification of targets, boundaries and barriers related to ECMs into the OptEEemAL platform. The user responsible for introducing this information is the Owner. The task consists mainly in the selection of the most suitable targets and barriers from a preconfigured list for the specific project at both district and building level. The selection of targets and barriers for buildings are defined for each typology of building. Selected targets and barriers are stored into the project repository.

Figure 33: UC7.1 Insert Targets, Boundaries and Barriers related to ECMs

5.9.2 Description of UI processes

5.9.2.1 Select Applicable Targets and an Option for Each Target

Table 44: Select applicable targets and an option for each target in UC7.1

Task Name	Select applicable targets and an option for each target
Task type	Manual
User	Owner
Interaction	Form
Description	The user selects the most suitable set of targets for the district or for a specific building typology. The applicable targets are selected by the user from a predefined list and the options for each target are also selected from a pre-configured list. Both, targets and options, can be different from the district scale to those applicable at building scale
Input data	List of selected targets and options for each target
Output data	Predefined list of targets and options

5.9.2.2 Select Applicable Barriers and an Option for Each Barrier

Table 45: Select applicable barriers and an option for each barrier in UC7.1

Task Name	Select applicable barriers and an option for each barrier
Task type	Manual
User	Owner
Interaction	Form
Description	The user selects the most suitable set of barriers for the district or for a specific building typology. The applicable barriers are selected by the user from a predefined list and the options for each barrier are also selected from a pre-configured list. Both, barriers and options, can be different from the district scale to those applicable at building scale
Input data	List of selected barriers and options for each barrier
Output data	Predefined list of barriers and options

5.9.2.3 Select Applicable Boundaries and an Option for Each Boundary

Table 46: Select applicable boundaries and an option for each boundary in UC7.1

Task Name	Select applicable boundaries and an option for each boundary
Task type	Manual
User	Owner
Interaction	Form
Description	The user selects the most suitable set of boundaries for the district or for a specific building typology. The applicable boundaries are selected by the user from a predefined list and the options for each boundary are also selected from a pre-configured list. Both, boundaries and options, can be different from the district scale to those applicable at building scale
Input data	List of selected boundaries and options for each boundary
Output data	Predefined list of boundaries and options

5.9.2.4 Select Building Typology

Table 47: Select building typology in UC7.1

Task Name	Select building typology
Task type	Manual
User	Owner
Interaction	Form
Description	The user selects the building typology to define targets, boundaries and barriers. The

	typology is selected from the list of typologies previously defined in the project.
Input data	Selected building typology
Output data	List of building typologies

5.9.3 GUI Mock-ups

5.9.3.1 Select Applicable Targets and an Option for Each Target

Select Targets and Options

TARGETS
Target1
Target2
Target3
Target4
Target5
Target6

Options
☒ YES
☐ NO

Add

TARGET	OPTION	
Target1	YES	
Target2	NO	
Target3	YES	

Ok Cancel




Figure 34: Select Applicable Targets and an Option for Each Target in UC7.1

5.9.3.2 Select Applicable Barriers and an Option for Each Barrier

Select Barriers and Options

BARRIERS	OPTIONS
Barrier1	Option1
Barrier2	Option2
Barrier3	Option3
Barrier4	Option4
Barrier5	Option5
Barrier6	Option6

Add

BARRIER	OPTION	
Barrier1	Option1	
Barrier2	Option3	
Barrier3	Option6	

Ok Cancel

Figure 35 Select Applicable Barriers and an Option for Each Barrier in UC7.1

5.9.3.3 Select Applicable Boundaries and an Option for Each Boundary

Select Boundaries and Options

BOUNDARIES	OPTIONS
Boundary1	Option1
Boundary2	Option2
Boundary3	Option3
Boundary4	Option4
Boundary5	Option5
Boundary6	Option6

Add

BOUNDARY	OPTION	
Boundary1	Option1	
Boundary2	Option3	
Boundary3	Option6	

Ok Cancel

Figure 36 Select Applicable Boundaries and an Option for Each Boundary in UC7.1

5.9.3.4 Select Building Typology

Targets, Boundaries and Barriers related to ECM

Typology:

Typology 1 ▼

Select Targets > Select Barriers > Select Boundaries

Figure 37: Select Building Typology in UC7.1

5.9.4 Input / Output Data Formats

Table 48: Input / Output Data Formats in UC7.1

Process	Parameter	Data Format	Restrictions
Select applicable targets and an option for each target	Targets	List of targets	
	Options	YES / NO	All targets should be given a YES / NO value
Select applicable barriers and an option for each barrier	Barriers	List of barriers	
	Options	YES / NO or NO / value	If the answer required is YES / NO, it is mandatory to be answered If the answer required is NO / value, when a value is not introduced it will be considered as a "NO"
Select applicable boundaries and an option for each boundary	Boundaries	List of <Selection from a list>	
	Options	List of <Selection from a list>	
Select building typology	Selected typology	<Selection from a list>	
	Building typologies	List of <predefined list>	

5.10 UC7.2 Insert Targets and Boundaries related to DPIs

5.10.1 Workflow

The workflow described in the following figure shows the process required for the insertion of the target and boundaries related to DPIs into the OptEEmAL platform. The user responsible for introducing this information is the Owner. The task consists mainly in the selection of the most suitable targets and boundaries from a preconfigured list for the specific project at both district and building level and the insertion of a value, when required. The selection of targets and boundaries for buildings are defined for each typology of building. Selected targets and boundaries are stored into the project repository.

Figure 38: UC7.2 Insert Targets, Boundaries and Barriers related to DPIs

5.10.2 Description of UI processes

5.10.2.1 Show Building Typologies and Select one of Them

Table 49: Show building typologies and select one of them in UC7.2

Task Name	Show building typologies and select one of them
-----------	---

Task type	Manual
User	Owner
Interaction	Form
Description	The user selects one of the building typologies in order to define targets and boundaries. The typology is selected from the list of typologies previously defined in the project.
Input data	Selected building typology
Output data	List of building typologies

5.10.2.2 Select Applicable Targets and a Value for Each Target

Table 50: Select applicable targets and a value for each target in UC7.2

Task Name	Select applicable targets and a value for each target
Task type	Manual
User	Owner
Interaction	Form
Description	The user selects the most suitable set of targets for a specific building typology or for the district. The applicable targets are selected by the user from a predefined list and the values for each target are provided by the user. Both, targets and options, applicable at district scale can be different from those applicable at building scale
Input data	List of selected targets and values for each target
Output data	Predefined list of targets and possible values when exist

5.10.2.3 Select Applicable Boundaries and a Value for Each Boundary

Table 51: Select applicable boundaries and a value for each boundary in UC7.2

Task Name	Select applicable boundaries and a value for each boundary
Task type	Manual
User	Owner
Interaction	Form
Description	The user selects the most suitable set of boundaries for a specific building typology or for the district. The applicable boundaries are selected by the user from a predefined list and the values for each boundary are provided by the user. Both, boundaries and values, can be different from the district scale to those applicable at building scale
Input data	List of selected boundaries and values for each boundary
Output data	Predefined list of boundaries and possible values when exist

5.10.2.4 Request Technical Users to Provide Comments

Table 52: Request technical users to provide comments in UC7.2

Task Name	Request technical users to provide comments
Task type	Manual
User	Owner
Interaction	Form
Description	When targets and boundaries for both building typology and the district have been selected by the Owner, he / she requests other technical users (Prime Designer and Prime Constructor) to check the selected lists and values. Selected targets and boundaries and the values for each of them are stored into the project repository.
Input data	Request

5.10.2.5 Implement Suggestions Provided by Other Users

Table 53: Implement suggestions provided by other users in UC7.2

Task Name	Implement suggestions provided by other users
Task type	Manual
User	Owner
Interaction	Form
Description	Suggestions, comments and validations sent by other users (Designer and Constructor) are collected by the Owner and the corresponding actions are carried out in order to implement the suggestions provided by others. . Depending on the values to be edited or if the modifications are performed for building typology or district, it is required to access to other processes described above.
Input data	Step of the process to access in order to implement the suggestions
Output data	Suggestions, comments and modifications provided by other users

5.10.2.6 Analyse Targets and Boundaries and Provide Comments

Table 54: Analyse targets and boundaries and provide comments in UC7.2

Task Name	Analyse targets and boundaries and provide comments
Task type	Manual
User	Prime Constructor and Prime Designer
Interaction	Form
Description	The user selects the list of targets or boundaries of the values for them, which have not been correctly identified or applied according to their criteria and proposes new ones, or comments for the implementation by the Owner. Comments to the targets and boundaries proposed by the Owner are stored into the project repository.
Input data	Comments
Output data	Complete list of target, boundaries and values defined by the Owner.

5.10.3 GUI Mock-ups

5.10.3.1 Show Building Typologies and Select one of Them

Targets, Boundaries and Barriers related to DPI

Typology / District
 Typology 1 ▼

Select Targets ⓘ Alex Murphy (Prime Designer) ▼ Ask User to Check ✓ Checked

Select Boundaries Mike Haggar (Prime Constructor) ▼ Ask User to Check ✗ Pending

Figure 39: Show building typologies and select one of them in UC7.2

5.10.3.2 Select Applicable Targets and a Value for Each Target

Select Applicable Targets and Values

TARGETS
Target1
Target2
Target3
Target4
Target5
Target6

Comments and Validations

Target1 should be 13 because
Alex Murphy (Prime Designer)

-

-

Custom Value

12

Add

TARGET	VALUE
Target1	12
Target2	0.2

Ok

Figure 40: Select Applicable Targets and a Value for Each Target in UC7.2

5.10.3.3 Select Applicable Boundaries and a Value for Each Boundary

Select Applicable Boundaries and Values

BOUNDARIES
Boundary1
Boundary2
Boundary3
Boundary4
Boundary5
Boundary6

Comments and Validations

Target1 should be 13 because
Mike Haggar (Prime Constructor)

-

-

Custom Value

12

Add

BOUNDARY	VALUE
Boundary1	12
Boundary2	0.2

Ok

Figure 41: Select Applicable Boundaries and a Value for Each Boundary in UC7.2

5.10.3.4 Request Technical Users to Provide Comments

See Figure 39: Show building typologies and select one of them in UC7.2

5.10.3.5 Implement Suggestions Provided by Other Users

See Figure 40: Select Applicable Targets and a Value for Each Target in UC7.2 and Figure 41: Select Applicable Boundaries and a Value for Each Boundary in UC7.2

5.10.3.6 Analyse Targets and Boundaries and Provide Comments

See Figure 40: Select Applicable Targets and a Value for Each Target in UC7.2 and Figure 41: Select Applicable Boundaries and a Value for Each Boundary in UC7.2

5.10.4 Input / Output Data Formats

Table 55: Input / Output Data Formats in UC7.2

Process	Parameter	Data Format	Restrictions
Show building typologies and select one of them	Selected typology	<Selection from a list>	
	Building typologies	List of <predefined list>	
Select applicable targets and a value for each target	Targets	List of <Selection from a list>	
	Values	List of <Selection from a list> when they are predefined.	
Select applicable boundaries and a value for each boundary	Boundaries	List of <Selection from a list>	
	Values	List of <Selection from a list> when they are predefined.	
Request technical users to provide comments	Request	Yes / No	
Implement suggestions provided by other users	Step of the process	Selection from a list	
	Suggestions	Free text	
	Targets	List of <Selection from a list>	
	Boundaries	List of <Selection from a list>	
	Values	List of <Selection from a list> when they are predefined.	
Analyse targets and boundaries and provide comments	Suggestions	Free text	Maximum length to be defined
	Targets	List of <Selection from a list>	
	Boundaries	List of <Selection from a list>	
	Values	List of <Selection from a list> when they are predefined.	

5.11 UC9 Check Strategies

5.11.1 Workflow

The workflow described in the following figure shows the process required for showing strategies to all IPD roles to verify and, if needed, editing or removing those ECMs that cannot be used in the retrofitting project. All the users of the platform participate in this task. It starts by showing the Prime Constructor the list of strategies included in the ECM repository that are applicable to the retrofitting project. Once one or more ECMs have been selected by the user, the choice and their configuration is stored in the project repository. The Prime Constructor is the user responsible for adding, editing and even removing a specific applicable strategy after having analysed them. For each selected strategy the Prime Constructor is able to analyse (i.e. view the characteristics, semantic and visual data), remove (i.e. eliminate strategies from those that will be assessed for the refurbishment project), edit (i.e. modify determined parameters of the strategy to generate a “customized” one), and add (i.e. include strategies previously eliminated by the user for the refurbishment project). After the Prime Constructor has finished the selection and edition of the applicable strategies, according to their knowledge and criteria, the final list of ECMs and their parameters are shown to the user. Then other actors in the project (Owner and Prime Designer) are requested to check the strategies and provide comments. Each of the users is able to analyse the strategies and provide comments. If the strategies proposed by the Prime Constructor are accepted by the others, the list of strategies is saved. If comments are provided by the other users, the Prime Constructor modifies the selected strategies according to the comments. This is repeated until the list of ECMs and parameters for them are accepted by all users (Owner, Prime Constructor and Prime Designer).

Figure 42: UC9 Check Strategies

5.11.2 Description of UI processes

5.11.2.1 Show Strategies

Table 56: Show strategies in UC9

Task Name	Show strategies
Task type	Manual
User	Prime Constructor
Interaction	Form
Description	The set of applicable ECMs identified by the OptEEmAL platform for the retrofitting project are shown to the user. It is also necessary to load from the project repository those strategies selected or edited in previous iterations.
Output data	List of strategies

5.11.2.2 Select Strategy

Table 57: Select strategy in UC9

Task Name	Select strategy
Task type	Manual
User	Prime Constructor

Interaction	Form
Description	For each of the applicable strategies, the user has the possibility to analyse, remove, add or edit the selected strategy.
Input data	Selected strategy
Output data	List of strategies

5.11.2.3 Analyse Strategy

Table 58: Analyse strategy in UC9

Task Name	Analyse strategy
Task type	Manual
User	Prime Constructor
Interaction	Form
Description	For the selected strategy, the user is able to analyse or view the characteristics (semantic and visual data) of the applicable ECMs. Edition is not allowed in this option. Comments provided by technical users (i.e. Prime Designer and Prime Constructor) are also visible for the user. This task is usually the step prior to editing or selecting a strategy.
Input data	Selected option (Add, Delete, Edit)
Output data	Complete list of parameters of the ECMs and comments from other users

5.11.2.4 Remove Strategy

Table 59: Remove strategy in UC9

Task Name	Remove strategy
Task type	Manual
User	Prime Constructor
Interaction	Form
Description	For the selected strategy, the user is able to remove or select an ECM to be assessed for the refurbishment project. Due to different reasons (knowledge, background, barriers, targets, etc.) the user can remove a specific strategy manually before the optimization process starts.
Output data	None

5.11.2.5 Edit Strategy

Table 60: Edit strategy in UC9

Task Name	Edit strategy
Task type	Manual
User	Prime Constructor
Interaction	Form
Description	For the selected strategy, the user is able to edit determined parameters of the applicable strategies. The edition is performed based on the criteria of the Prime Constructor and also taking into consideration comments provided by the other users (i.e. Prime Designer and Owner). These edited strategies override for the refurbishment project the ECMs that were taken as a basis.
Output data	Complete list of parameters of the ECMs

5.11.2.6 Add Strategy

Table 61: Add strategy in UC9

Task Name	Add strategy
Task type	Manual
User	Prime Constructor
Interaction	Form
Description	For the selected strategy, the user is able to remove and select an ECM to be assessed for the refurbishment project. A previously removed strategy can be considered to be selected after user comments or a new iteration after visualizing the results for a previously selected strategy.
Output data	None

5.11.2.7 Show Final List of ECMs and Parameters and Request for Comments

Table 62: Show final list of ECMs and parameters and request for comments in UC9

Task Name	Show final list of ECMs and parameters and request for comments
Task type	Manual
User	Prime Constructor
Interaction	Form
Description	The set of applicable ECMs selected and edited by the Prime Constructor for the retrofitting project is shown to the user. At this stage, the user is requested to ask other actors in the project to analyse the identified strategies and accept or provide comments about the applicability of strategies according to the project characteristics.
Output data	List of strategies

5.11.2.8 Analyse Strategy and Provide Comments

Table 63: Analyse strategy and provide comments in UC9

Task Name	Analyse strategy and provide comments
Task type	Manual
User	Owner and Prime Designer
Interaction	Form
Description	For the selected strategy, the user is able to analyse and view the characteristics (semantic and visual data) of the applicable ECMs. For each strategy the user can provide relevant comments that are stored in order for the Prime Constructor to decide the use or not of this strategy in the optimization process. Comments can also suggest editing or modifying some parameters of the ECM in order to be used.
Input data	Comments
Output data	Complete list of parameters of the ECMs

5.11.3 GUI Mock-ups

5.11.3.1 Show Strategies

Strategy

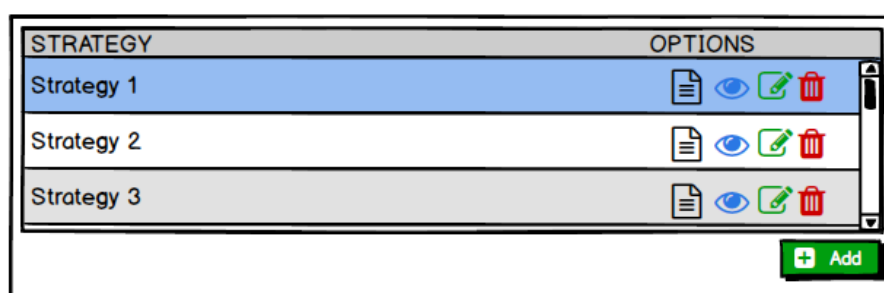


Figure 43: Show Strategies in UC9

5.11.3.2 Select Strategy

See Figure 43: Show Strategies in UC9

5.11.3.3 Analyse Strategy

See Figure 43: Show Strategies in UC9

5.11.3.4 Remove Strategy

See Figure 43: Show Strategies in UC9

5.11.3.5 Edit Strategy

See Figure 43: Show Strategies in UC9

5.11.3.6 Analyse Strategy and Provide Comments

See Figure 43: Show Strategies in UC9

5.11.4 Input / Output Data Formats

Table 64: Input / Output Data Formats in UC9

Process	Parameter	Data Format	Restrictions
Show Strategies	List of strategies	List of <Selection from a list>	
Select Strategy	Selected strategy	<Selection from a list>	
	List of strategies	List of <Selection from a list>	
Analyse Strategy	Parameters of the ECM	To be specified for each parameter	
	Selected option	<Selection from a list>	Possible values: "Add, Delete, Edit or Back"
Edit Strategy	Parameters of the ECM	To be specified for each parameter	
Show final list of ECMs and parameters and request for comments	List of strategies	List of <Selection from a list>	
Analyse Strategy and Provide Comments	Comment	Free text	Maximum length
	Parameters of the ECM	To be specified for each parameter	

5.12 UC10 Insert Prioritisation Criteria

5.12.1 Workflow

The workflow described in the following figure shows the process required for the insertion of the prioritisation criteria into the OptEEmAL platform. All the users defined in the platform participate in this task: the Owner is the main one to introduce all the values and asks for the validation of the rest. The task starts by showing the Owner the two options available to establish the prioritisation criteria: simplified method and detailed method. If the simplified method is chosen by the Owner, a list of predefined weighting schemes, which define the general objectives to be pursued in the optimisation process, is presented to the user. Then the Owner can select a general objective for the optimisation process. The selection is validated, commented or edited by other users (Prime Constructor and Prime Designer) prior to the final validation of the selected option. If the Owner selects the detailed method firstly an explanation of the methodology for pairwise comparison is presented to the user. Then they are asked to introduce values that assess the importance of a DPI over another according to the users' criteria (pairwise comparison of DPIs). Once the pairwise comparison is completed, the other users (Prime Constructor and Prime Designer) are requested by e-mail to validate the selection performed by the Owner. These users can provide validation, comments and suggestions that are implemented or rejected by the Owner in order to select the final options for the prioritisation criteria.

Figure 44: UC10 Insert Prioritisation Criteria

5.12.2 Description of UI processes

5.12.2.1 Select Method (Simplified vs Detailed)

Table 65: Select method (simplified vs detailed) in UC10

Task Name	Select method (simplified vs detailed)
Task type	Manual
User	Owner
Interaction	Form
Description	The user selects between the two options for the establishment of the prioritisation criteria: simplified method or detailed method.
Input data	Selected method

5.12.2.2 Select a General Objective

Table 66: Select a general objective in UC10

Task Name	Select a general objective
Task type	Manual
User	Owner
Interaction	Form
Description	The user selects the general objective for the optimisation according to a predefined list of weighting schemes associated to the general objectives
Input data	Selected objective
Output data	Predefined list of general objectives and weighting scheme

5.12.2.3 Show Explanation on Methodology for Pairwise Comparison

Table 67: Show explanation on methodology for pairwise comparison in UC10

Task Name	Show explanation on methodology for pairwise comparison
Task type	Manual
User	Owner
Interaction	Form
Description	The user is presented with explanation on methodology for pairwise comparison.
Output data	Explanation on methodology for pairwise comparison

5.12.2.4 Show Comparison Matrix 1, 2 or 3

Table 68: Show comparison matrix 1, 2 or 3 in UC10

Task Name	Show comparison matrix 1, 2 or 3
Task type	Manual
User	Owner
Interaction	Form
Description	The user compares DPIs in pairs and applies a value from 1 to 9 to the comparison
Input data	List of values that assess the importance of one DPI over another
Output data	Comparison matrix 1, 2 and 3

5.12.2.5 Show Values Applied to each Pair of DPIs

Table 69: Show values applied to each pair of DPIs in UC10

Task Name	Show values applied to each pair of DPIs
Task type	Manual
User	Owner
Interaction	Form
Description	Values resulting from the application of the pairwise comparison matrixes are presented to the user in order to be validated or modified. If any of the values are not correct they can be edited in each of the comparison matrix described in the previous process
Output data	Complete list of values for comparison between DPIs

5.12.2.6 Validate and Send e-mail to Others for Validation

Table 70: Validate and send e-mail to others for validation in UC10

Task Name	Validate and send e-mail to others for validation
Task type	Manual
User	Owner
Interaction	Form
Description	When values showing the user preferences for comparison of DPIs are correct, they are validated by the Owner and an e-mail is sent to other users (Prime Designer and Prime Constructor) to check these values.
Input data	Validation

5.12.2.7 Implement Suggestions Provided by Other Users

Table 71: Implement suggestions provided by other users in UC10

Task Name	Implement suggestions provided by other users
Task type	Manual
User	Owner
Interaction	Form
Description	Suggestions, comments and validations sent by other users (Prime Designer and Prime Constructor) are collected by the Owner and the corresponding actions are carried out in order to implement the suggestions provided by others. Depending on the values to be edited or if the general objective needs to be modified, the implementation of the suggestions require access to other processes described above.
Input data	Step of the process to access in order to implement the suggestions
Output data	Implemented suggestions, comments and recommendations provided by other users

5.12.2.8 Validate and Send Justifications

Table 72: Validate and send justifications in UC10

Task Name	Validate and send justifications
Task type	Manual
User	Owner
Interaction	Form
Description	The user validates the final values for DPLs comparison or the general objective selected. The justifications, if the Owner decides not to accept the suggestions provided by other users, is sent to the users providing the suggestions. Prioritisation criteria and justifications are stored into the project repository.
Input data	Validation
Output data	Prioritisation criteria, comments and justifications

5.12.2.9 Analyse Information and Provide Comments and Modifications

Table 73: Analyse information and provide comments and modifications in UC10

Task Name	Analyse information and provide comments and modifications
Task type	Manual
User	Prime Constructor and Prime Designer
Interaction	Form

Description	The user selects values for DPLs comparison or general objective, which have not been correctly applied or selected according to their criteria and proposes new ones or provide comments or suggestions for the implementation by the Owner. Comments and suggestions are stored into the project repository.
Input data	Comments
Output data	Complete list of values for comparison between DPLs or selected objective

5.12.3 GUI Mock-ups

5.12.3.1 Select Method (Simplified vs Detailed)

Prioritisation Criteria

Figure 45: Select Method (Simplified vs Detailed) in UC10

5.12.3.2 Select a General Objective

Figure 46: Select a General Objective in UC10

5.12.3.3 Show Explanation on Methodology for Pairwise Comparison

Explanation on Methodology

Pairwise Comparison	
DPI 1	DPI 2
DPI 1	DPI 3
DPI 1	DPI 4
DPI 2	DPI 3
DPI 2	DPI 4

Save Cancel

Figure 47: Show explanation on methodology for pairwise comparison in UC10

5.12.3.4 Show Comparison Matrix 1, 2 or 3

Comparison Matrix

Matrix 1	
DPI 1	DPI 2
DPI 1	DPI 3
DPI 1	DPI 4
DPI 2	DPI 3
DPI 2	DPI 4

Matrix 2	
DPI A	DPI B
DPI A	DPI C
DPI B	DPI C

Matrix 3	
DPI 11	DPI 22
DPI 11	DPI 33
DPI 22	DPI 33

Save Cancel

Figure 48: Show comparison matrix 1, 2 or 3 in UC10

5.12.3.5 Show Values Applied to each Pair of DPIs

See Figure 48: Show comparison matrix 1, 2 or 3 in UC10

5.12.3.6 Validate and Send e-mail to Others for Validation

See Figure 45: Select Method (Simplified vs Detailed) in UC10

5.12.3.7 Implement Suggestions Provided by Other Users

See Figure 45: Select Method (Simplified vs Detailed) in UC10

5.12.3.8 Validate and Send Justifications

See Figure 45: Select Method (Simplified vs Detailed) in UC10 and Figure 69: Messaging System - Inbox

5.12.3.9 Analyse Information and Provide Comments and Modifications

See Figure 45: Select Method (Simplified vs Detailed) in UC10

5.12.4 Input / Output Data Formats

Table 74: Input / Output Data Formats in UC10

Process	Parameter	Data Format	Restrictions
Select method (simplified vs detailed)	Selected method	<Selection from a list>	Possible values: simplified or detailed
Select a general objective	Selected objective	<Selection from a list>	
	List of general objectives	List of <Selection from a list>	Initially 5 different general schemes will be defined identified by a descriptive name and with the weighting scheme associated
Show explanation on methodology for pairwise comparison	Explanation on methodology	Free text or link to a document	
Show comparison matrix 1, 2 or 3	List of DPIs to be compared	List of <Selection from a list>	
	List of values for comparison between DPIs	List of <Number>	From 1 to 9
Show values applied to each pair of DPIs	List of values for comparison between DPIs	List of <Number>	From 1 to 9
Validate and send e-mail to others for	Validate	Yes/No	

validation			
Implement suggestions provided by other users	Step of the process to implement the suggestions	Process name or number	General objective Comparison Matrix 1 Comparison Matrix 2 Comparison Matrix 3
	Suggestions, comments and recommendations	Free text	
Validate and send justifications	Validate	Yes/No	
	Justifications	Free text	
Analyse information and provide comments and modifications	Comments	Free text	
	List of DPIs compared	List of <Selection from a list>	
	List of values for comparison between DPIs	List of <Number>	From 1 to 9
	Selected objective	<Selection from a list>	

5.13 UC11 Show Defined Problem

5.13.1 Workflow

The workflow described in the following figure shows the process to show the user in a clear way the problem defined in the platform (targets, boundaries, barriers, prioritisation criteria and ECMs to be applied) as well as the results of the DPIs from the baseline scenario. All the users defined in the platform participate in this task. The task starts presenting the Prime Designer the information that describes the problem. At this point the Prime Designer checks whether the description is correct or not according to his / her understanding and criteria. If the Prime Designer considers that the description is acceptable, he / she needs to check the description with the other users (Prime Constructor and Owner) and to send an e-mail requesting the validation or any feedback for modifications. Both, Owner and Prime Constructor validate the problem description or propose changes. If the validation is received from both users the information is stored and UC is completed. However, if any of the users propose any changes they need to be implemented by the Prime Designer. The selection of the information to be modified will direct the user to the corresponding UC (UC7.1, UC9, UC7.2 or UC10).

Figure 49: UC11 Show Defined Problem

5.13.2 Description of UI processes

5.13.2.1 Show Information Describing the Problem

Table 75: Show information describing the problem in UC11

Task Name	Show information describing the problem
-----------	---

Task type	Manual
User	Prime Designer
Interaction	Form
Description	The user is presented with baseline DPLs, introduced targets, boundaries, barriers and prioritisation criteria, as well as list of applicable ECMs per building typology. This information could be presented in different tabs or in the same tab.
Output data	Baseline DPLs, TBBs, Prioritisation criteria, List of applicable ECMs.

5.13.2.2 Validate and Send e-mail to Others for Validation

Table 76: Validate and send e-mail to others for validation in UC11

Task Name	Validate and send e-mail to others for validation
Task type	Manual
User	Prime Designer
Interaction	Form
Description	If information describing the problem is correct from the point of view of the user, it is validated and an e-mail is sent to other users (Owner and Prime Constructor) to check the proposed problem description.
Input data	Validate
Output data	Information describing the problem

5.13.2.3 Select Information to Modify

Table 77: Select information to modify in UC11

Task Name	Select information to modify
Task type	Manual
User	Prime Designer
Interaction	Form
Description	Depending on the parameters, which require revision according to the point of view of any of the users, it will be necessary to go back to a specific UC. If the parameters to be edited are related with targets, boundaries or barriers related to ECMs, the user is redirected to the UC7.1. If the parameters to be edited are related with the selection of strategies to apply, the user is redirected to UC9. If the parameters to be edited are related with targets, boundaries or barriers related to DPLs, the user is redirected to UC7.2. And finally if the parameters to edit are related with prioritisation criteria, the user is redirected to UC10.
Input data	Information to be modified

5.13.2.4 Validate and Send Notification

Table 78: Validate and send notification in UC11

Task Name	Validate and send notification
Task type	Manual
User	Prime Designer
Interaction	Form
Description	The user validates the general problem description. Notification about the final problem description is sent to other users. Baseline DPLs, TBBs, Prioritisation criteria and list of applicable ECMs per building typology are stored into the project repository. This information could be presented in different tabs or in the same tab.
Input data	Validation
Output data	Baseline DPLs, TBBs, Prioritisation criteria, Configuration related to ECMs.

5.13.2.5 Analyse Information and Propose Changes if Considered

Table 79: Analyse information and propose changes if considered in UC11

Task Name	Analyse information and propose changes if considered
Task type	Manual
User	Prime Constructor and Owner
Interaction	Form
Description	The user analyses the information describing the problem and selects aspects of the definition that are not correctly applied according to their understanding and proposes new ones for the implementation by the Prime Designer.
Input data	Changes proposed
Output data	Baseline DPLs, TBBs, Prioritisation criteria, Configuration related to ECMs.

5.13.3 GUI Mock-ups

5.13.3.1 Show Information Describing the Problem

Project Overview

DPIs Targets Boundaries and Barriers Prioritisation Criteria ECMs

BOUNDARY	VALUE
Boundary1	12
Boundary2	0.2

TARGET	VALUE
Target1	12
Target2	0.2

Orwell George (Owner)
[Approve](#) [Decline](#) [Comment](#)

Mike Haggard (Prime Constructor)
[Declined](#) [Comment](#)

Figure 50: Show information describing the problem - DPIs in UC11

Project Overview

DPIs Targets Boundaries and Barriers Prioritisation Criteria ECMs

TARGET	OPTION
Target1	Option 6
Target2	Option 5

BARRIER	OPTION
Barrier1	Option 6
Barrier2	Option 5

BOUNDARY	OPTION
Boundary1	Option 6
Boundary2	Option 5

Orwell George (Owner)
[Approved](#)

Mike Haggard (Prime Constructor)
[Declined](#) [Comment](#)

Figure 51: Show information describing the problem - TBBs in UC11

5.13.3.2 Validate and Send e-mail to Others for Validation

Defined Problem

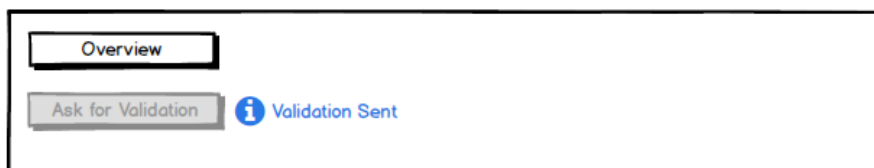


Figure 52: Validate and send e-mail to others for validation in UC11

5.13.3.3 Select Information to Modify

See Figure 50: Show information describing the problem - DPIs in UC11 and Figure 51: Show information describing the problem - TBBs in UC11

5.13.3.4 Validate and Send Notification

See Figure 50: Show information describing the problem - DPIs in UC11 and Figure 51: Show information describing the problem - TBBs in UC11

5.13.3.5 Analyse Information and Propose Changes if Considered

See Figure 50: Show information describing the problem - DPIs in UC11 and Figure 51: Show information describing the problem - TBBs in UC11

5.13.4 Input / Output Data Formats

Table 80: Input / Output Data Formats in UC11

Process	Parameter	Data Format	Restrictions
Show information describing the problem	Baseline DPIs	List of <numeric value>	DPIs cannot be normalized. Therefore it is difficult to indicate a range of values (it depends on the DPI)
	Targets	List of <Selection from a list>	
	Boundaries	List of <Selection from a list>	
	Barriers	List of <Selection from a list>	
	List of values for comparison between DPIs	List of <Number>	From 1 to 9
	Selected objective	<Selection from a list>	
	List of applicable ECMs per building typology	List of <Selection from a list>	
Validate and send e-mail to others for validation	Validate	Yes/No	

Select information to modify	Information to modify	<Selection from a list>	Possible values: - TBBs related to ECMs - TBBs related to DPLs - Prioritisation Criteria
Validate and send notification	Validate	Yes/No	
	Baseline DPLs	List of <numeric value>	DPLs cannot be normalized. Therefore it is difficult to indicate a range of values (it depends on the DPL)
	Targets	List of <Selection from a list>	
	Boundaries	List of <Selection from a list>	
	Barriers	List of <Selection from a list>	
	List of values for comparison between DPLs	List of <Number>	From 1 to 9
	Selected objective	<Selection from a list>	
	List of applicable ECMs per building typology	List of <Selection from a list>	
Analyse information and propose changes if considered	Changes proposed	Free text	Maximum length
	Baseline DPLs	List of <numeric value>	DPLs cannot be normalized. Therefore it is difficult to indicate a range of values (it depends on the DPL)
	Targets	List of <Selection from a list>	
	Boundaries	List of <Selection from a list>	
	Barriers	List of <Selection from a list>	
	List of values for comparison between DPLs	List of <Number>	From 1 to 9
	Selected objective	<Selection from a list>	
	List of applicable ECMs per building typology	List of <Selection from a list>	

5.14 UC16 Select optimal scenario

5.14.1 Workflow

The workflow described in the following figure shows the process required for selecting the optimal scenario from the set of best scenarios generated in the optimisation process. All the users defined in the platform participate in this task. The task starts when the Owner is informed (through e-mail) that the optimisation process has ended. When the Owner enters the platform, a GUI show the list of optimised scenarios generated. The Owner is able to analyse the generated scenarios and request other actors in the project to analyse the scenarios and provide comments. Each of the technical users (Prime Constructor and Prime Designer) are able to analyse the scenarios and provide comments. Taking into account the comments provided by the technical partners, the Owner selects the optimal scenario from the generated list of scenarios.

Figure 53: UC16 Select Optimal Scenario

5.14.2 Description of UI processes

5.14.2.1 Show Optimised Scenarios and Request Comments

Table 81: Show optimised scenarios and request for comments in UC16

Task Name	Show optimised scenarios and Request comments
Task type	Manual
User	Owner
Interaction	Form
Description	The set of optimised scenarios generated in the optimisation process are shown to the user. At this stage, the user is requested to ask technical users in the project to analyse the scenarios and provide comments.
Output data	Set of optimised scenarios

5.14.2.2 Analyse Scenario

Table 82: Analyse scenario in UC16

Task Name	Analyse scenario
Task type	Manual
User	Owner
Interaction	Form
Description	For each of the optimised scenarios, the user is able to analyse the results of the optimisation process and the applied ECMs, prior to receiving the comments from the technical users. This task can be done for one, many or the whole list of optimised scenario or can be even skipped by the Owner. The list of ECMs applied in each scenario will necessarily match the ECM with the exact building to be applied. Some of the resulting DPLs for each scenario can be shown at building level while all are shown

	also at district level. It is necessary to take into account that the scenarios should be presented to the user organised in a ranking.
Output data	Results of the optimisation process: the list of ECMs applied in each one of the scenarios and the results of the DPLs for each scenario.

5.14.2.3 Analyse Scenarios and Provide Comments

Table 83: Analyse scenarios and provide comments in UC16

Task Name	Analyse scenarios and provide comments
Task type	Manual
User	Prime Constructor and Prime Designer
Interaction	Form
Description	For the optimised scenarios, the user is able to analyse or view the results of the optimisation process and the applied ECMs. For each scenario the user can provide relevant comments that are stored in order for the Owner to select the optimal scenario.
Input data	Comments
Output data	Results of the optimisation process: the list of ECMs applied in each one of the scenarios and the results of the DPLs for each scenario

5.14.2.4 Analyse Comments from Technical Users

Table 84: Analyse comments from technical users in UC16

Task Name	Analyse comments from technical users
Task type	Manual
User	Owner
Interaction	Form
Description	For the list of optimised scenarios, the Owner is able to analyse the comments provided by technical users (i.e. Prime Designer and Prime Constructor). This task is the step prior to the selection of the optimal scenario.
Output data	Comments from the technical users

5.14.2.5 Select Optimal Scenario

Table 85: Select optimal scenario in UC16

Task Name	Select optimal scenario
Task type	Manual
User	Owner

Interaction	Form
Description	After reviewing and considering comments from technical users to the optimised scenarios, the user selects the optimal scenario.
Input data	Scenario selected by the user
Output data	List of optimised scenarios

5.14.3 GUI Mock-ups

5.14.3.1 Show Optimised Scenarios and Request for Comments

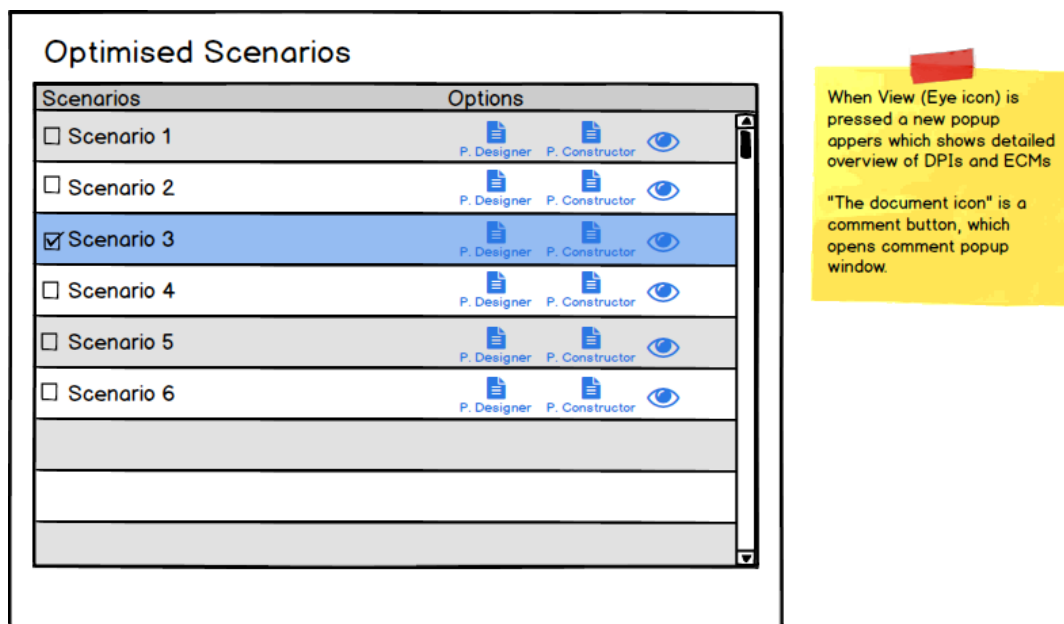


Figure 54: Show optimised scenarios and request for comments in UC16

5.14.3.2 Analyse Scenario

Optimised Scenarios

DPIs

BOUNDARY	VALUE
Boundary1	12
Boundary2	0.2

More info in text about DPI...

TARGET

TARGET	VALUE
Target1	12
Target2	0.2

More info in text about ECM...

ECMs

TARGET	OPTION
Target1	Option 6
Target2	Option 5

BARRIER	OPTION
Barrier1	Option 6
Barrier2	Option 5

BOUNDARY	OPTION
Boundary1	Option 6
Boundary2	Option 5

Figure 55: Analyse scenario in UC16

5.14.3.3 Analyse Scenarios and Provide Comments

Optimised Scenarios

Scenario 1 - Prime Designer Comments

Comment of Prime Designer for Scenario 1...

Figure 56: Analyse scenarios and provide comments in UC16

5.14.3.4 Analyse Comments from Technical Users

See Figure 56: Analyse scenarios and provide comments in UC16

5.14.3.5 Select Optimal Scenario

See Figure 54: Show optimised scenarios and request for comments in UC16

5.14.4 Input / Output Data Formats

Table 86: Input / Output Data Formats in UC16

Process	Parameter	Data Format	Restrictions
Show Optimised Scenarios and Request for Comments	List of optimised scenarios	List of <Selection from a list>	
Analyse Scenario	DPIs results	List of <numeric value>	
	List of ECMs applied	List of <Selection from a list>	
Analyse Scenarios and Provide Comments	DPIs results	List of <numeric value>	
	List of ECMs applied	List of <Selection from a list>	
	Comments	Free text	Maximum length
Analyse Comments from Technical Users	Comments	Free text	Maximum length
Select Optimal Scenario	List of optimised scenarios	List of <Selection from a list>	

5.15 UC17 Configure export data

5.15.1 Workflow

The workflow described in the following figure shows the process required for the configuration of the information to be exported that will be needed outside the platform. All the users defined in the platform can participate in this task. The task starts when the user consults the data repository in order to get the information associated to the scenario selected as optimal. The selected scenario as well as all the information related to this scenario is shown to the user. At this point the user is requested to select the information that should be exported from the selected scenario. The different kinds of information (i.e. text, charts, files) are presented to the user and the required are selected by the user. This information is stored into the project repository.

Figure 57: UC17 Configure Export Data

5.15.2 Description of UI processes

5.15.2.1 Review Information about Selected Scenario

Table 87 Review information about selected scenario in UC17

Task Name	Review information about selected scenario
Task type	Manual

User	Owner / Prime Designer / Prime Constructor
Interaction	Form (including 2D/3D maps, charts, texts)
Description	All the information associated to the selected scenario is obtained from the project repository and shown to the user through a specific GUI. The information to be shown to the user includes geometry files, charts, text data , etc.
Output data	Information associated to the selected scenario (to be detailed in Task 1.5)

5.15.2.2 Select Information to be Exported

Table 88: Select information to be exported in UC17

Task Name	Select information to be exported
Task type	Manual
User	Owner / Prime Designer / Prime Constructor
Interaction	Form
Description	The user selects, from a list of possible options, the information that is exported from the OptEEmAL platform.
Output data	List of exportable information (to be detailed in Task 1.5)

5.15.3 GUI Mock-ups

5.15.3.1 Review Information about Selected Scenario

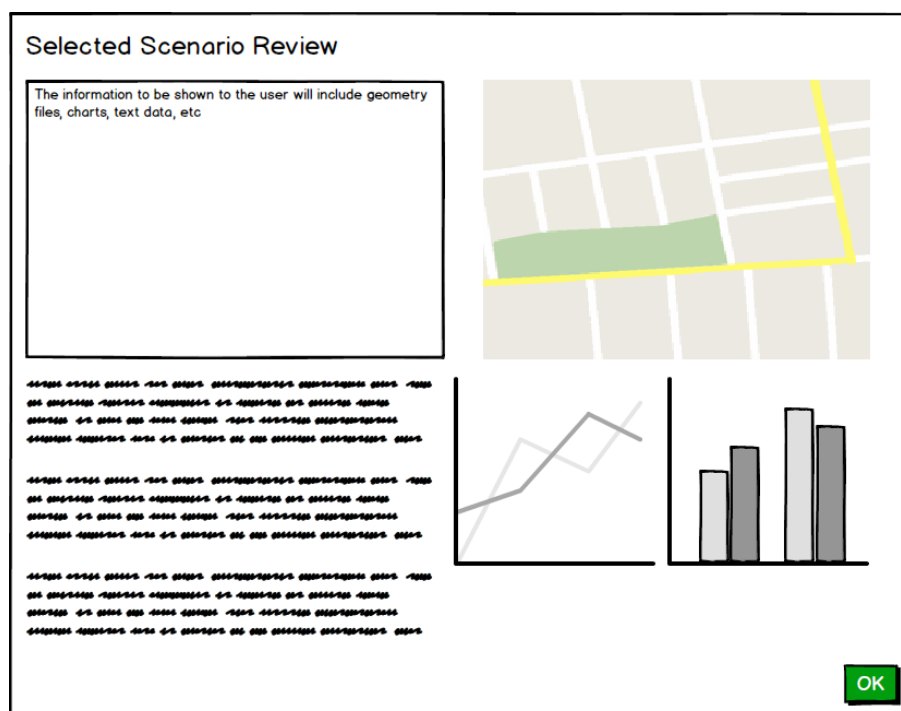


Figure 58: Review information about selected scenario in UC17

5.15.3.2 Select Information to be Exported

Figure 59: Select information to be exported in UC17

5.15.4 Input / Output Data Formats

Table 89: Input / Output Data Formats in UC17

Process	Parameter	Data Format	Restrictions
Review information about selected scenario	Information associated to the selected scenario		(To be detailed in Task 1.5)
Select information to be exported	List of exportable information	List of <Selection from a list>	(To be detailed in Task 1.5)

5.16 UC20 Export project text data

5.16.1 Workflow

The workflow described in the following figure shows the process of generation of a pdf file containing the description of the project inserted by the user and the results of the proposed scenario for rehabilitation considering the general problem description previously agreed by all the users. All the users defined in the platform can participate in this task and all the users are able to obtain the same output from the platform, which is highly important for following the IPD approach.

The task starts when the platform collects all the information describing the project and the proposed scenario for retrofitting, as well as the configuration selected by the user for exportation of project information. The user visualizes a preview of the information to be exported in the pdf file and can accept or decline the result. In case the user does not want to generate the pdf file with the information shown on the screen the platform proposes the user to come back to UC17 and configure the exportable data again.

Figure 60: UC20 Export project text data

5.16.2 Description of UI processes

5.16.2.1 Review Documentation Preview

Table 90: Review documentation preview in UC20

Task Name	Review documentation preview
Task type	Manual
User	Owner / Prime Designer / Primer Constructor
Interaction	Form
Description	Preview the information to be exported into a pdf file. The document is generated according to the configuration that the user has previously established.
Output data	Information associated to the defined problem and the selected scenario (To be detailed in Task 1.5)

5.16.3 GUI Mock-ups

5.16.3.1 Review Documentation Preview

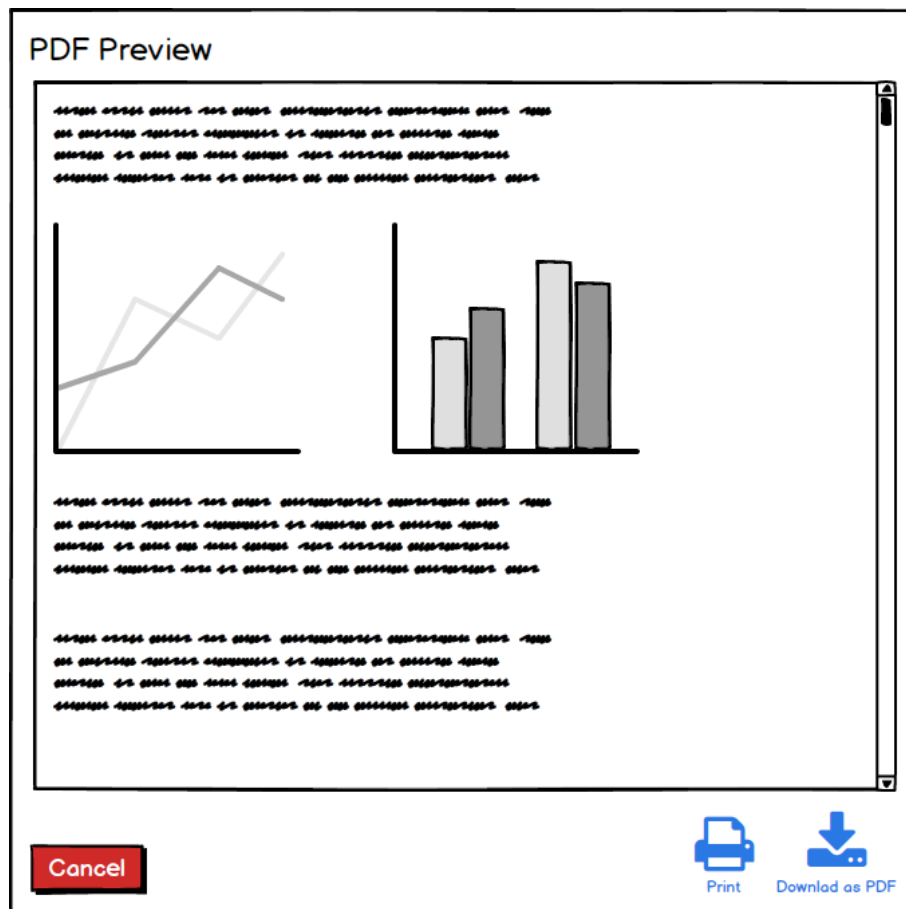


Figure 61: Review documentation preview in UC20

5.16.4 Input / Output Data Formats

Table 91: Input / Output Data Formats in UC20

Process	Parameter	Data Format	Restrictions
Review documentation preview	Information about defined problem		(To be detailed in Task 1.5)
	Information about selected scenario		(To be detailed in Task 1.5)

5.17 UC21 Export project charts

5.17.1 Workflow

The workflow described in the following figure shows the process of generation of an XLS file containing the important information generated in the platform. The file includes, among others, information of the DPLs calculation, a ranking of scenarios and the selected scenario. All the users defined in the platform can participate in this task and all the users are able to obtain the same output from the platform, which is highly important for following the IPD approach. The task starts when the platform collects all the information describing the project and the proposed scenario for

retrofitting, as well as the configuration selected by the user for exportation of project information. The user visualizes a preview of the information to be exported in the XLS file and can accept or decline the result. In case the user does not want to generate the file with the information shown on the screen the platform proposes the user to come back to UC17 and configure the exportable data again.

Figure 62: UC21 Export project charts

5.17.2 Description of UI processes

5.17.2.1 Review Documentation Preview

Table 92: Review documentation preview in UC21

Task Name	Review documentation preview
Task type	Manual
User	Owner / Prime Designer / Primer Constructor
Interaction	Form
Description	Preview the information to be exported into a XLS file. The document is generated according to the configuration that the user has previously established.
Output data	Important information generated in the platform (to be detailed in Task 1.5)

5.17.3 GUI Mock-ups

5.17.3.1 Review Documentation Preview

Chart Preview

BOUNDARY	VALUE
Boundary1	12
Boundary2	0.2

TARGET	VALUE
Target1	12
Target2	0.2

TARGET	OPTION
Target1	Option 6
Target2	Option 5

BARRIER	OPTION
Barrier1	Option 6
Barrier2	Option 5

BOUNDARY	OPTION
Boundary1	Option 6
Boundary2	Option 5

Cancel

Figure 63: Review documentation preview in UC21

5.17.4 Input / Output Data Formats

Table 93: Input / Output Data Formats in UC21

Process	Parameter	Data Format	Restrictions
Review documentation preview	Values of the DPs		(To be validated and detailed in Task 1.5)
	Ranking of Scenarios		(To be validated and detailed in Task 1.5)
	Selected Scenario		(To be validated and detailed in Task 1.5)

5.18 UC22 Export project files

5.18.1 Workflow

The workflow described in the following figure shows the process of exportation of the necessary information to implement the energy retrofitting project in the district: enhanced BIM, CityGML, list of recommendations, or report of scenarios. All the users defined in the platform can participate in this task and all the users are able to obtain the same output from the platform, which is highly important for following the IPD approach. The task starts when the platform shows the user the

available information to download, if the required information is not available, it is redirected to the Use Case where the set of exportable data is configured (UC 17). If the required information is available, the user selects the exportable data in the correct data format and finally the selected file is be downloaded into the user's device.

Figure 64: UC22 Export project files

5.18.2 Description of UI processes

5.18.2.1 Review Available information

Table 94: Review available information in UC22

Task Name	Review available information
Task type	Manual
User	Owner / Prime Designer / Primer Constructor
Interaction	Form
Description	Show all the information retrieved from the repositories available to be exported: enhanced BIM, enhanced CityGML and all the relevant information configured by the user previously.
Output data	Enhanced BIM, CityGML and relevant information (to be detailed in Task 1.5)

5.18.2.2 Select Format(s) to Export and Download the Selected File

Table 95: Select format(s) to export and download the selected file in UC22

Task Name	Select format(s) to export and download the selected file
Task type	Manual
User	Owner / Prime Designer / Primer Constructor
Interaction	Form
Description	Select one or more formats to export project data, export the information in the selected format(s) and mark the selected information as “exported”
Input data	Selected format(s)
Output data	Enhanced BIM, CityGML and relevant information (to be detailed in Task 1.5)

5.18.3 GUI Mock-ups

5.18.3.1 Review Available information

See Figure 59: Select information to be exported in UC17

5.18.3.2 Select Format(s) to Export and Download the Selected File

See Figure 59: Select information to be exported in UC17

5.18.4 Input / Output Data Formats

Table 96: Input / Output Data Formats in UC22

Process	Parameter	Data Format	Restrictions
Show available information	Enhanced BIM,		(To be detailed in Task 1.5)
	CityGML		(To be detailed in Task 1.5)
	Relevant Information		(To be detailed in Task 1.5)
Select format to export and download the selected file	Enhanced BIM,		(To be detailed in Task 1.5)
	CityGML		(To be detailed in Task 1.5)
	Relevant Information		(To be detailed in Task 1.5)
	Selected Formats		(To be detailed in Task 1.5)

5.19 Other Screens

Other screens which don't fit in any Use Case identification are defined here.

5.19.1 Project Overview GUI Mock-up

Project 1
Date Created: 12.12.2016
Last Edit: 01/02.2017 - 16:27

IPD Group
Select Prime Designer: [Email] [Invite] [Remove]
Select Prime Constructor: [Email] [Invite] [Cancel]

Project Data
Upload CityGML: [Check CityGML]
Upload IFC File: [Upload IFC File]
Table with columns: File Name, Status, CityGML Link, Options

Contextual Data
Query Data: [Query] [Re-Query]
Check and Edit Contextual Data
Search Unstructured Data
Assign Use to Buildings
Buildings and Typologies
Request Validation: [Request Validation]
Alex Murphy (Prime Designer): [Provide Complementary Info]
Building Elements / Materials: [Building Energy Systems] [Building Schedules]
District Energy Systems: [District Energy Systems]

DPI
Show Diagnostic DPIs

Targets, Boundaries and Barriers related to ECM
Typology: [Typology 1]
[Select Targets] [Select Barriers] [Select Boundaries]

Targets, Boundaries and Barriers related to DPI
Typology / District: [Typology 1]
[Select Targets] [Select Barriers] [Select Boundaries]
[Ask User to Check] [Checked] [Pending] [Rejected]

Strategy
STRATEGY: [Strategy 1] [Strategy 2] [Strategy 3]
OPTIONS: [Add]

Prioritisation Criteria
Simplified Method
General Objective
Methodology
Comparison Matrix
[Ask User to Check] [Checked] [Pending] [Rejected]

Defined Problem
Overview
[Ask for Validation] [Validation Sent]

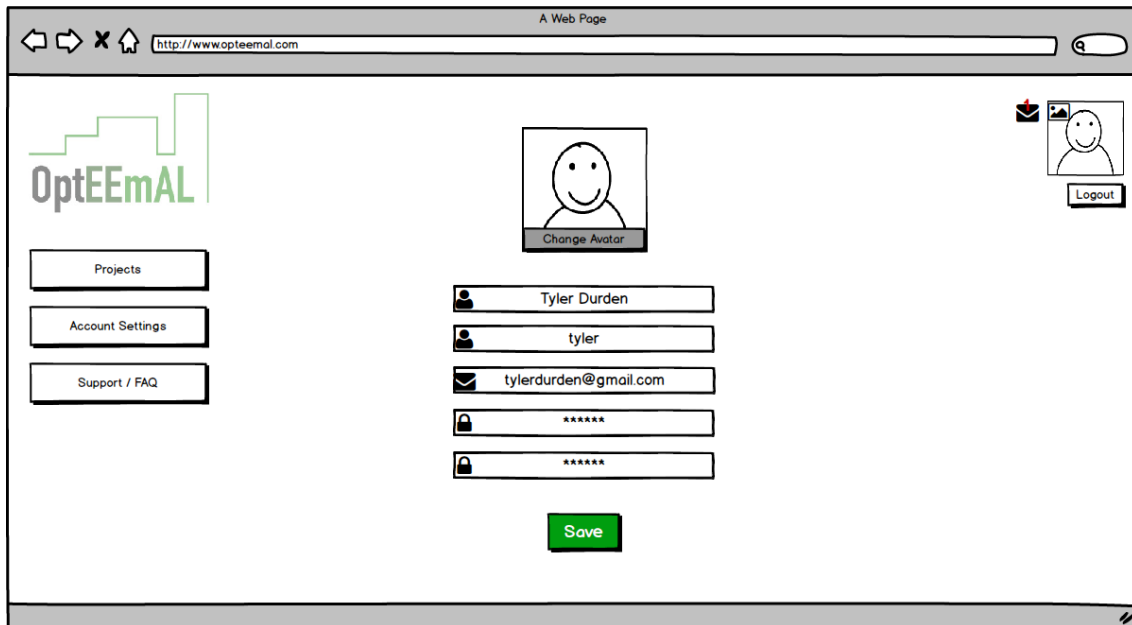
Optimal Scenario
Show Scenarios

Export Project
Selected Scenario Review
Export

Callouts:
- When clicked, file chooser appears and starts upload
- If role is "Prime Designer" -> "Send Validation"
- If "Send Validation" is sent, "Info" icon will show up with tooltip
- If role is "Prime Constructor" or "Owner" -> "Approve / Decline"
- If approved a "Check" mark will be shown
- If declined a "Cross" mark will be shown
- Only "Prime Designer" can link IFC and CityGML
- "Building and Typologies" becomes available to other users after Owner requests validation
- Only owner could invite and remove IPD Group roles. Others will see it as readonly
- Project Data won't be available (disabled) if all roles for IPD Group is not set
- If a role doesn't have privileges to Upload or Link Files he will see this panel as readonly
- Possible scenarios upon, comments, justifications, approvals and rejections

Figure 65: Project Overview – Project Dashboard mock-up

5.19.2 User Account GUI Mock-up



A Web Page

http://www.opteemal.com

OptEEmAL

Projects

Account Settings

Support / FAQ

Change Avatar

Tyler Durden

tyler

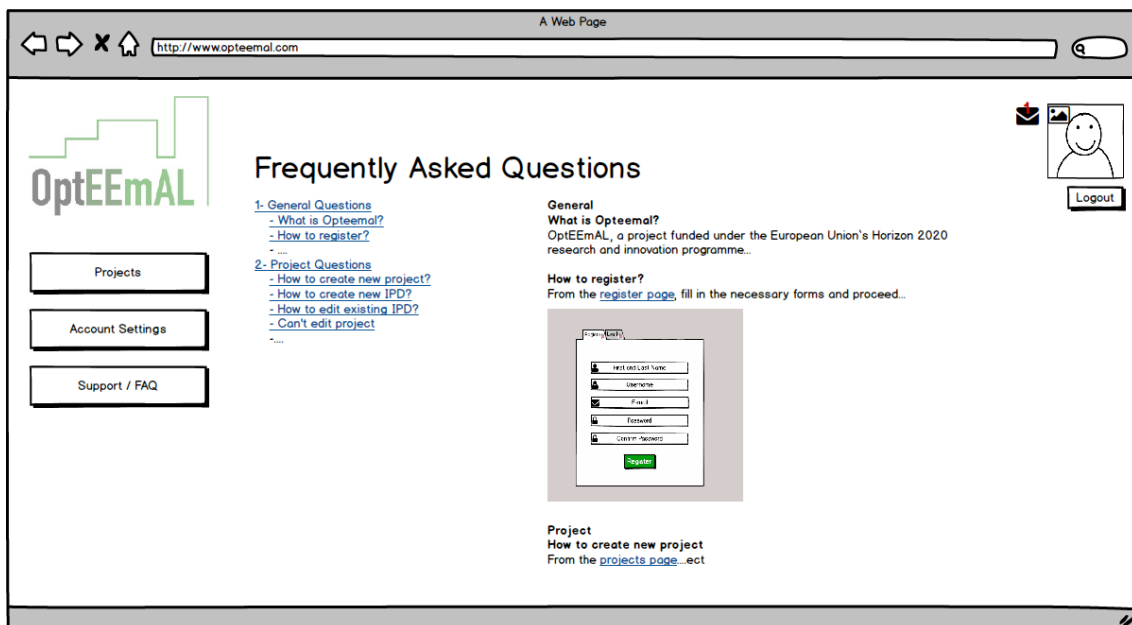
tylerdurd@gmail.com

Save

Logout

Figure 66: User Account

5.19.3 Support (FAQ) GUI Mock-up



A Web Page

http://www.opteemal.com

OptEEmAL

Projects

Account Settings

Support / FAQ

Frequently Asked Questions

1- General Questions

- What is Opteemal?
- How to register?
- ...

2- Project Questions

- How to create new project?
- How to create new IPD?
- How to edit existing IPD?
- Can't edit project
- ...

General

What is Opteemal?

OptEEmAL, a project funded under the European Union's Horizon 2020 research and innovation programme...

How to register?

From the [register page](#), fill in the necessary forms and proceed...

Project

How to create new project

From the [projects page](#)...

Register

Logout

Figure 67: Support Frequently Asked Questions

5.19.4 Visitor Overview

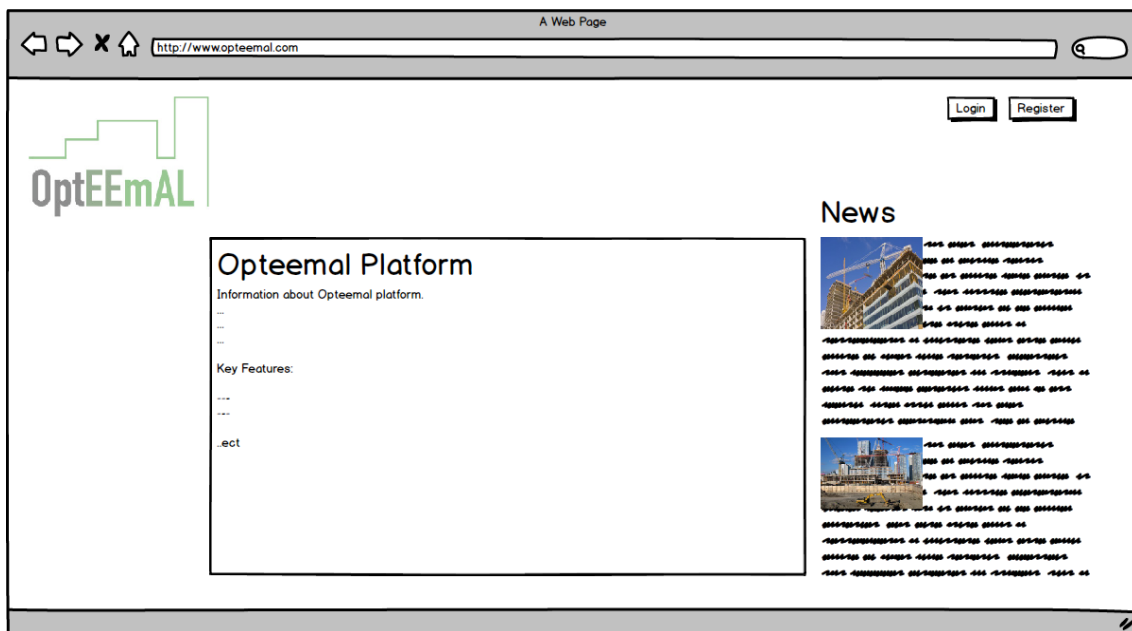


Figure 68: Visitor Overview

5.19.5 Messaging System

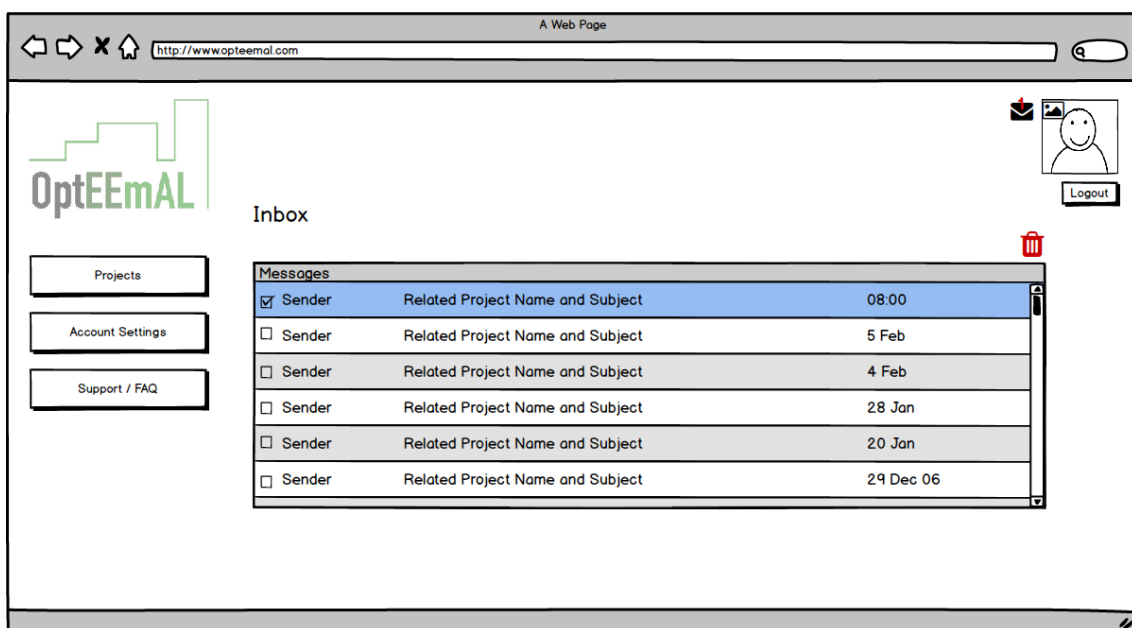


Figure 69: Messaging System - Inbox

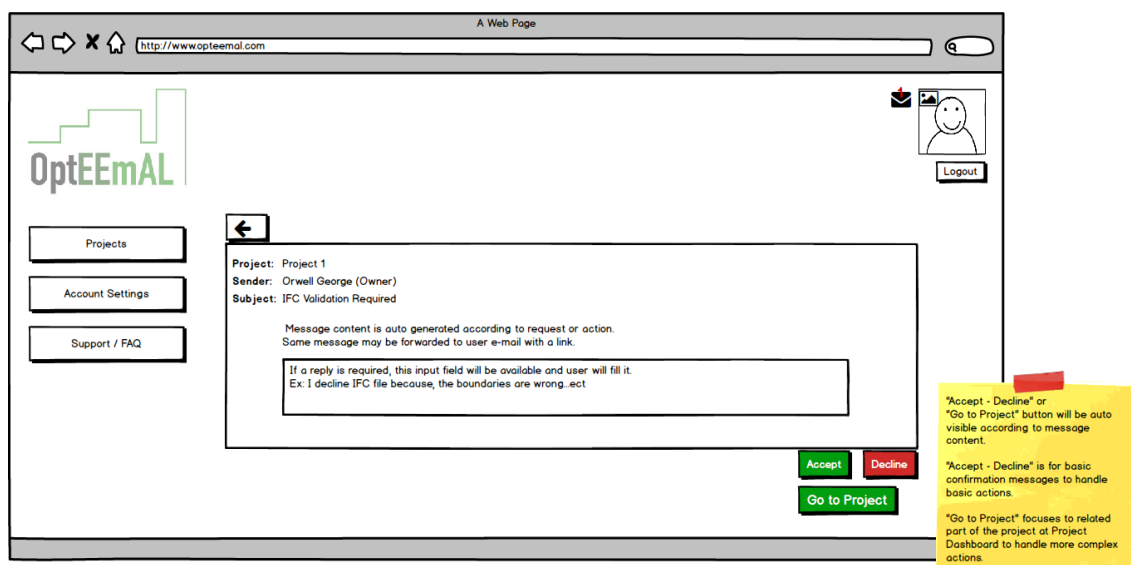


Figure 70: Messaging System – Reply

5.19.6 Platform Dashboard

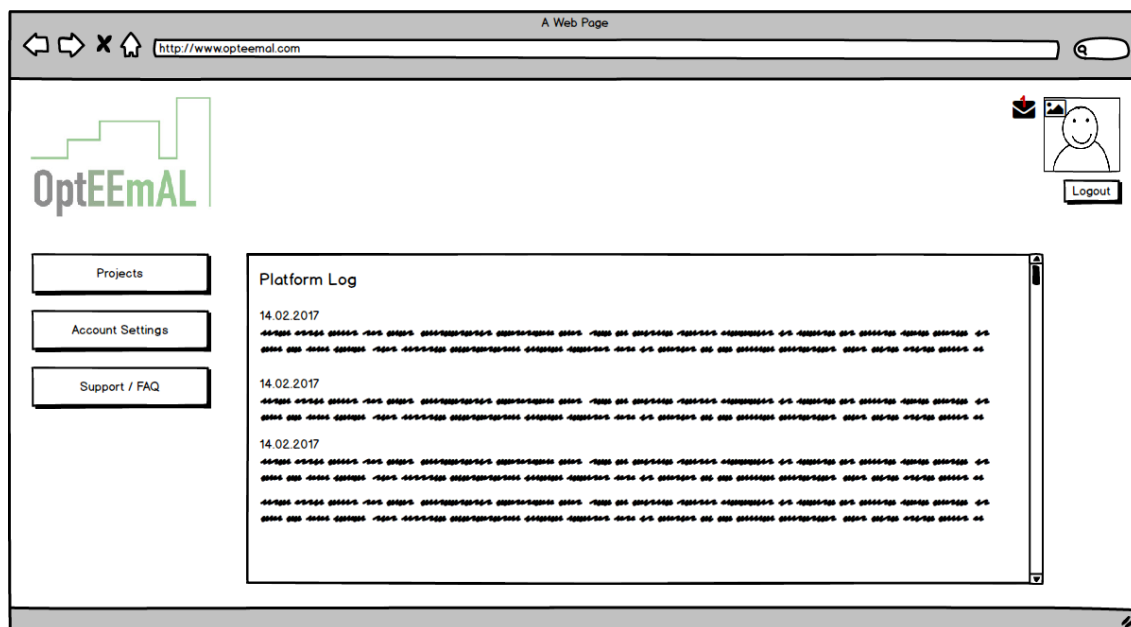


Figure 71: Platform Dashboard and Platform Logs

6 Conclusions

The work described in this document lays the foundation for the development of the user interfaces of the OptEEmAL platform. This deliverable details, both in form and in content, the user interfaces of the platform. A final list of 16 Use Cases requires user interaction. Some of them are related only with input data processes, others are only related with output data processes, while others are connected to both processes (input and output). An intensive effort performed in this task has been devoted to the detailed definition of each of the identified Use Cases, covering the processes which refer to the user interaction, their detailed description, inputs and outputs, data formats, type of interaction and GUI mock-ups.

Following the IPD approach, it has been identified that the main decisions of a rehabilitation project must be taken consensually between the main agents involved in the project (Owner, Prime Designer or Prime Constructor). The definition of workflows of use cases establishes that it is necessary to provide the platform with the optimal coordination mechanisms so that it allows and facilitates communication between agents and coordinated participation in decision making. This coordination is especially relevant in use cases related to the selection of optimal strategies and scenarios and interpretation of the initial situation (UC9, UC11 and UC16), as well as when defining the context of the project (Targets, Boundaries, Barriers and Prioritization Criteria) (UC7.1, UC7.2 and UC10).

Another key aspect identified in this document is the need to combine different types of user interfaces for user interaction with the platform in the different steps of the process to be carried out with the OptEEmAL platform. The project combines information from different scales (e.g. building, district), nature (e.g. text, 2D, 3D) and format (e.g. IFC, CityGML, XLS). This variability requires adapting the way in which the information is shown to the user making use of different existing resources. The deployment of forms will be appropriate in those processes in which the user must enter a data or select from a list of possible options (this resource will be used in most UCs, in some cases combined with others). The use of graphs will be especially useful to show results and compare alternatives (UC6, UC11 and UC16). Finally, the use of 2D or 3D maps and the interaction with 3-dimensional models is especially useful in those stages of the process in which the elements with which the user interacts are geometric models and both the geometry and the location of the model are of special relevance (UC3.1, UC3.2 and UC3.3).

The current state of ongoing work in other tasks (especially Task 1.5 “Outputs definition: diagnosis of current scenario for EE district retrofitting scenarios”) and the information dependencies of these tasks has meant that it has not been possible to identify the desired level of detail in the input and output data, as well as the formats, of the use cases related to the exportation of the project data (UC17, UC20, UC21 and UC22). This detailed identification will be included in deliverable D1.6 “Outputs definition: information and documentation resulting from the design” and the definition of the interfaces for this information will be done in the task of developing the user interfaces of the platform (Task 5.4 “Graphical User Interfaces development”).

The work to be performed in a next stage will be the development of the GUI of the platform, which will be carried out in Task 5.4 and will be based on the outcomes of this deliverable. However, although the GUI definition has been thoroughly studied and carried out in consensus with the main developers of the different modules of the platform, some modifications may arise when the GUIs are finally implemented and tested in the future.

7 References

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