


e-CUSTOM

A Web-based Collaboration System for Mass Customization

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Summary: This document contains the Scenario/Pilot Cases description being decomposed on a five steps methodology approach. Based on the user requirements collected in D1.1, this deliverable identifies and describes the users and actions involved within the Use Cases of the envisioned e-CUSTOM platform. The document also highlights where the implementation effort is needed through comparing the currently used platforms and the e-CUSTOM platform and establishes the acceptance criteria to check the platform to be implemented.

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1 MANAGEMENT BRIEF

The purpose of this deliverable is to:

1. Identify and describe all the use cases which univocally describe the scenarios/pilot cases, including actors, activities decomposition and workflows.
2. Define an implementation strategy, in the detail allowed at this stage of the project, which identifies what components of the platform require more implementation effort to be able to introduce new e-CUSTOM functionalities.
3. Establish acceptance and validation criteria which will serve as reference in future stages of the project and allows coming back and checking if the implementation is meeting with the requirements.

Further information is provided in the following:

1. Chapter 3 is dedicated to clarifying the methodology that will be followed along the next sections of the document to describe the Orthotics and Automotive pilot cases/scenarios.
2. Chapter 4 is focused on the Automotive Industry Case and include subsections for information coming from previous deliverable D1.1, identification of use cases and actors, formalization of operational processes, AS-IS and TO-BE analysis, implementation strategy and acceptance criteria.
3. Chapter 5 is focused on the Orthotics Medical Case and include subsections for information coming from previous deliverable D1.1, identification of use cases and actors, formalization of operational processes, AS-IS and TO-BE analysis, implementation strategy and acceptance criteria.

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2 INTRODUCTION

Following with the work done during the development of WP1 in which e-CUSTOM platform specifications were defined, once a review of existing technologies has been conducted and user requirements have been analysed; now it is time to analyse this content from an implementation perspective. This deliverable intends to use these inputs to clearly define the functionality that e-CUSTOM platform must provide to the users and how these innovative capabilities must interact with the users for their involvement with the product customization process as far as possible.

In order to do that, systems engineering and software engineering methods have been applied. This allows modelling the selected pilot cases integrating the information gathered during the work of WP1 and reflected in the D1.1. The methodology used for modelling the pilot cases is essentially based on decomposition of the activities that potential users can perform through the e-CUSTOM platform. This allows aligning the project activity with one of its objectives such as identifying common features that appear in different representative sectors where the mass customization of products clearly provides added value, such as Automotive and Orthotics cases. Identifying a common infrastructure and functionalities leads to the possible generalization of e-CUSTOM platform for its application in other scenarios not considered in this project.

Throughout this document it can be observed in great detail the envisioned performance of the e-CUSTOM platform and which parts of this performance are new or improved, and how the platform helps to engage users of all layers of the manufacturing network in creating the product enabling mass customization.

3 METHODOLOGICAL APPROACH TO SCENARIO/ PILOT CASES DESCRIPTION

In this section, the steps for the “Scenario/ Pilot Case Description” methodology will be summarily presented. The methodological approach starts from the availability of Requirements for the Use cases, provided in D1.1.

3.1 Overview of the methodological approach

The following is the list of the steps that lead to the complete description of the use case. Each step is here just briefly described, since the objective here is to provide an overview and, thus, just to list the steps.

- **Step 1 – Identification of ‘use cases’ and actors involved with pilot case owners:** during this step, for each pilot case, the analyst interacts with personnel from the industrial partner owner of the case, in order to identify the ‘operational processes’(also known as ‘use cases’) and the involved actors of such pilot case. Output of this step 1 is a first, non-formalized high-level description of the processes/activities composing the pilot case. (Enumeration of Use Cases and Actors and text description)
- **Step 2 - Formalization of ‘use cases’ with modelling tools:** during step 2, for each pilot case, operational processes are decomposed in elementary activities, to describe how they fulfil the operational requirements. In order to do so, first of all, a formal description of

the process is advisable. Output of present step 2 is a set of formal process schemes, drawn out at different decomposition levels. (1- A UML Use Cases & Actors Diagram-whole pilot case; 2-UML Use Case Diagrams & Documentation – individual use cases)

- **Step 3 – Mapping operational requirements on processes and activities with the defined pylons:** output of this step 3 is the current process/activity features description (AS-IS) attached to each process/activity envisioned characteristics provided in the formal description resulting from step 2 (TO-BE) considering the Pylon distribution of the e-CUSTOM project.
- **Step 4 – Definition of the implementation strategy:** a possible roadmap for the implementation of the enabled processes has to be defined within this step. This goes through the comparison of the newly enabled processes (TO-BE) with the existing processes (AS-IS) and the definition of the implementation strategy.
- **Step 5 – Identification of verification and acceptance criteria:** during this step, for each use case, the analyst, with the help of the industrial partner, will define verification and acceptance criteria to check the compliance of the use case description with the use case requirements previously defined.

3.2 Identification of ‘use cases’ and actors involved with pilot case owners (Step 1)

Coming from the requirements previously collected and identified in D1.1, this step will process this information and identify the actors and the actions within e-CUSTOM system. e-CUSTOM system considers an actor as a person, organization, or external system that plays a role in one or more interactions with the system. Hence, a use case describes a sequence of actions that provide something of measurable value to an actor

Once the use cases are identified, they have to be described in a few lines.

3.3 Formalization of operational processes with modelling tools (Step 2)

This step aims to consolidate the use cases and actors identified in step 1 through use case diagrams and documentation that shows the relationships among actors and use cases within the system. The documentation associated to each use case will clarify the main goal, the actors involved, preconditions and post-conditions and the basic flow of sub-activities. Therefore, these sub-activities will decompose coherently the use case extracting all the interactions and data exchanges between the actors and the e-CUSTOM system.

The diagrams are built using a de facto industry standard such as Unified Modelling Language (UML). UML is a standardized general-purpose modelling language which includes a set of graphic notation techniques among which are Use Case Diagrams and Activity Diagrams, both particularly useful for the purpose of this step 2.

For each pilot case, a Use Cases Diagram depicts several use cases, actors, their associations, and optional system boundary boxes. Actors are drawn as stick figures or boxes and each use case is drawn as a horizontal ellipse.

3.4 Mapping operational requirements on processes and activities with the defined pylons (Step 3)

Before defining an implementation plan the differences between the existing processes and the new/improved ones need to be understood. This step intends to show the gap between the conventional operational processes and the e-CUSTOM expected operational processes. Output of step 2 provides a complete description of functionality and activities that can be performed by user. During this step, analysts carry out an ‘As-Is’ and ‘To-Be’ analysis directly linked with identified use cases and their relation to the pylons. The output of this step is the following table which identifies clearly in which modules/parts of the e-CUSTOM system implementation effort has to be made.

Use Case	Pylon	As-is	To-Be
UC1		Current procedure	New Procedure (the one to be implemented)

Table 1: Example Table of the ‘As-Is’ and ‘To-Be’ analysis

3.5 Definition of the implementation strategy (Step 4)

Knowing which operational processes are enhanced by e-CUSTOM system, this step proposes alternatives to achieve the e-CUSTOM required functionality, aiming to clearly define the implementations needed to undergo a facile transition of the business process from the ‘As-Is’ to the ‘To-Be’ redesigned process. The implementation strategy provides an initial list of change requirements including, if necessary, detailed technological aspects and additional requirements for the construction of the ‘To-Be’ components. The output of this step is the following table which establishes a preliminary roadmap for the e-CUSTOM system development.

Use Case	Pylon	To-Be	Implementation category	Technological aspects (if necessary)
UC1		New Procedure (the one to be implemented)	<input type="checkbox"/> No changes needed <input type="checkbox"/> Modifications required <input type="checkbox"/> New implementation	

Table 2: Example Table of the ‘Implementation Strategy’

3.6 Identification of verification and acceptance criteria (Step 5)

The verification and acceptance criteria define the process and management of the acceptance and verification activities at this stage of the project. This step establishes the procedure and tests that will be followed to check those evidences that demonstrate that the final e-CUSTOM system developed has satisfied all the verification and acceptance criteria and fulfilled all the operational requirements and functionality identified along D.1.1 and D.1.2. For each pilot case this criteria is identified and allow comparing the results obtained with the expected results. This verification and acceptance criteria uses the background of the use cases described within this document, and if there is a correct match for every use case, the achievement of e-CUSTOM system objectives is demonstrated. This step aims to provide

confidence that the delivered system meets the business requirements of users. The output of this step are checklists that allows to check the fulfillment with specifications and any other method that allows to quantify or to establish metrics to measure the degree of achievement.

4 AUTOMOTIVE INDUSTRY CASE: PERSONALIZED CARS FOR THE CUSTOMER

In the automotive scenario, the final customer is involved in car personalization during the product development process. This approach allows the customers to express their product requirements and carry out product realization process by elaborating the feedback coming from the market.

4.1 Information coming from D1.1

The basis for the work performed in this use case is the list of requirements identified in D1.1. These requirements are summarized in the following table:

	User requirements	Owner
Pylon I	Interface for customer's feedback (like/dislike)	End User
	Registration Form	End User
	Provide username and password	End User
	Application Selection: "car style choice" or "accessories design" or "send us your ideas"	End User & OEM
	Participation in different sessions: "car style choice" or "accessories design" or "send us your ideas"	End User & OEM
	Compilation of user preferences	e-CUSTOM & OEM
Pylon II	Identify best production/assembly solution	e-CUSTOM & OEM
	Load information about OEM/Supplier/Dealer	OEM
Pylon III	Evaluation of environmental impact	e-CUSTOM
Pylon IV	Secure transmission of personal information and data	e-CUSTOM
	Online tracking of the status	End User

Table 3: User requirements

Based on these requirements, the presented methodology will be followed in order to clearly identify how their connections with the specific use cases.

4.2 Step 1 – Identification of 'use cases' and actors involved with pilot case

After an exhaustive analysis of user requirements and specifications documented in D.1.1 performed by analyst and industrial partners, the following actors and use cases have been

identified to provide a complete description of the automotive pilot case required functionality.

4.2.1 Users/Actors Identification

Regarding the automotive case, some actors are involved with different roles and activities to perform:

- *End User (Potential customer)* – The end user connects to e-CUSTOM web-site. He visualizes design alternative suggestions and he chooses his favourite car design or accessory features. The action of choosing a car design might repeat several times depending on the state (from gross to detail) of the design proposal. The end user can also propose his personal ideas (by means of comments or sketches);
- *OEM*: the manufacturers perform different tasks, according to the roles that it holds:
 - OEM-Designer Department: develops numerous designs of the future car and propose different alternative features for the accessories; collects and elaborates feedbacks coming from end users and update proposed alternatives on the system;
 - OEM-Manufacturing Department: on the basis of inserted data (related to internal plants, supplier plants and dealer centers) takes strategic production and assembling decisions (MAKE or BUY options) and identify the actors in charge of production/ assembling (supply chain optimization);
- *Supplier / dealer*: information about dealer/supplier costs, location, facilities, etc. is stored in the platform.

4.2.2 Use Case UC1: Access to website

The website can be accessed by potential customers or by OEM. The potential customer initially goes to the e-CUSTOM application in order to take part in the car customization process. Once he/she arrives, e-CUSTOM System asks the end user for authentication credentials. If it is a new user, the user is required to register providing some information (UC2). On the other hand, if the user has registered before, he/she is required to login using /her login and password combination (UC3). The OEM goes to the e-CUSTOM application in order to view end users contributions or to update information. The OEM owns login and password which allows interacting with the e-CUSTOM with different privileges and the activities that can be performed are different from the end users.

4.2.3 Use Case UC2: Register to website

The user has to fill in a registration form, providing some personal information: Name, Surname, Female/ Male, Country, Age, Occupation, E-mail, Possession of FIAT car? [yes/no]. After the registration, the system provides the user with a login and a password combination (could be provided by e-mail and authentication procedure). Some of the provided personal information is optional and others mandatory; they are useful if the user would like to access the web application again in the future. The e-CUSTOM system stores user registration data. After the user registration the next action will be to login to website (UC3).

4.2.4 Use Case UC3: Login to website

The user has to fill the login and password fields with the information provided previously by e-CUSTOM system and validate the insertion. The e-CUSTOM system checks that the user

exists within the users' related stored data. If this process is negative, the system asks the user to try again. If it is positive, the user gains access to the website. After a positive login process the e-CUSTOM system offers the possibility to participate in customization process through the next options: Participation to "car style choice" (UC4), participation to "accessory design" (UC8), participation to "send us your ideas" (UC13). The user selects his/her choice.

4.2.5 Use Case UC4: Car Style choice

The e-CUSTOM system visualizes the home page of "Car Style Choice", that includes the following information: FIAT model name, the current stage of FIAT car style process (i.e. selection between 7 models, selection between 4 modules, etc.), expiration date for the participation to car style session, potential notes/comments (for instance, if the expiration date is gone, a message like "At the moment the current phase of car style choice is closed. Fiat is elaborating your previous feedbacks" could appear), date for the reopening of the next car style session.

The e-CUSTOM system allows the user to see the results of previous steps of car style session (UC5). The e-CUSTOM system visualizes a certain number of style alternatives, for each alternative the system visualizes some different figures (AR/VR interface if available) and the user expresses his/her preferences. The number of proposed style alternatives changes according to the phase of style process: at the beginning of the process, the number of different options can be high, but it is reducing according to the process progress; besides, the level of details of the proposed model becomes greater.

The e-CUSTOM system allows the user to write comments (UC6). The e-CUSTOM system stores user's selection and associate him/her univocally as the author. After the comments e-CUSTOM system asks the user if he wants to modify his/her selection/comment (return to "Car Style Choice" home page), or if he/she wants to participate to other session (return to e-CUSTOM application home page) or if he/she wants to quit from application. The user selects his/her choice. When the expiration date for car style choice is gone, the system elaborates users' feedback in terms of expressed preferences and comments (UC9), and updates data in car style choices home page adding, for instance, a notifying message: "At the moment the current phase of car style choice is closed. Fiat is elaborating your previous feedback") and showing the reopening session date (if known). The e-CUSTOM system sends end users feedbacks results to the OEM (UC9). At this point, the OEM accesses the application and goes to the "Car Style Choice", where the system asks the OEM to update information (UC7) but first, and depending on the type of information the OEM wants to update, the OEM is required to create new style alternatives (UC12), for instance, in case that the information is related with models or style alternatives. (The OEM can update directly information related to expiration date, car style history, comments, parts, disabling, etc.)

After that, and when the OEM closes the style process, the e-CUSTOM system contacts by e-mail the registered users in order to inform them that a new car style session is opened.

4.2.6 Use Case UC5: View car style history

From the Car style choice, the end user can select the option to visualize all the reported results of the previous car style sessions. The e-CUSTOM system shows an interface with the previous steps results.

4.2.7 Use Case UC6: Write comments

The e-CUSTOM system allows the user to write comments in a dedicated window and the customer has to define if his/her opinion is positive or negative (like/dislike). The comments will be structured, for instance between “strength points” and “weakness points”. The e-CUSTOM system stores user’s comments and associate him/her univocally as the author.

4.2.8 Use Case UC7: Update information

Depending on which one of the different processes (Car Style choice/Accessory Design) the OEM intends to update information, the interface will allow managing different parameters.

If the information updating option is used from Car style choice process, the OEM selects the information category to update between model, style alternatives, new expiration date, car style history, comments, parts disabling, etc. and then updates data uploading new alternatives, uploading new images for each alternative and updating the car style history.

If the information updating option is used from Accessory design process, the OEM selects the information category to update between accessories, features of each accessory, and options for each feature modifying in terms of quantity, names and images.

4.2.9 Use Case UC8: Accessory Design

The e-CUSTOM system visualizes the home page of “Accessories design”, which includes a list of accessories (name and image for each accessory). The end user selects the accessory. For the selected accessory, the system visualizes a set of features. The user selects the feature. For the selected features, the system visualizes some options (in the form of descriptions and/or images). If available, AR/VR interfaces are used to visualize the part in an enhanced fashion. For the selected features, the system visualizes an environmental impact index. The user selects the favorite feature alternative. e-CUSTOM system stores user’s selection. The e-CUSTOM system is able to univocally associate provided selection to the specific user. The e-CUSTOM system asks the user if he/she wants to quit from the designing of the specific accessory (return to the “Accessory design” home page), or if he/she wants to participate to other session (return to e-CUSTOM application home page) or if he/she wants to quit the application. The user selects his/her choice. When the system has collected a certain number of users’ feedback regarding accessory design, or at OEM request, the system elaborates data for each accessory (UC9) and sends them to the OEM. At this point, the OEM access the application and goes to the “Accessory Design”, where the system asks the OEM to update information (UC7) but first, and depending on the type of information the OEM wants to update, the OEM is required to create new style alternatives (UC12).

After that, and when the OEM closes the accessory design process, the e-CUSTOM system contacts by e-mail the registered users in order to inform them that new accessories/features/options have been inserted.

4.2.10 Use Case UC9: Receive end users feedback

The e-CUSTOM system elaborates those feedbacks and sends results to the OEM to be interpreted. The OEM receives the feedbacks from the e-CUSTOM system and elaborates the results according to a method that has to be defined. All the users’ feedbacks collected are stored and are at OEM disposal.

Each feedback inserted (selection, comment, sketch) is stored by the system and univocally associated to the specific user.

4.2.11 Use Case UC10: Receive sketches

The e-CUSTOM system allows the OEM to request all the uploaded sketches or a certain threshold number can be established to trigger the elaboration of results. When any of the aforementioned events occur the system sends the sketches to the OEM.

4.2.12 Use Case UC11: Receive comments

The e-CUSTOM system allows the OEM to request all the uploaded comments or a certain threshold number can be established to trigger the elaboration of results. When any of the aforementioned events occur the system sends the comments to the OEM.

4.2.13 Use Case UC12: Creation of new alternatives

The creation of new style alternatives will be according to internal style development process and visualizes photorealistic sketches produced by OEM Style Department. Feedback obtained from “Car style choice” and “Send your ideas” sessions are used as guidelines in the style concept development process.

4.2.14 Use Case UC13: Send ideas

The e-CUSTOM system visualizes the home page of “Send us your idea” and asks the user if he/she wants to insert his/her own sketches regarding the whole vehicle (UC15) or insert comments (UC14). The user makes his/her selection. When the system has collected a certain number of users’ sketches or at OEM request, the system sends the sketches to the OEM (UC9). The e-CUSTOM system asks the user if he/she wants to insert another sketch, or insert another comment or participate to another session (return to application home page), or quit from application. The user makes his/her selection. If the user selects to insert some comments (UC14) the system offers an interface to do it. When the system has collected a certain number of users’ message or at OEM request, the system sends the comments to OEM structured by category.

4.2.15 Use Case UC14: Write categorized comments

The system asks the user to select the category of the comment in a dedicated window, according to the object of the comment. The user can select between the following categories (materials, accessories, kit, colour, car design, propulsion, others). The user selects the category and writes the message. The e-CUSTOM system is able to univocally associate comments to the specific user.

4.2.16 Use Case UC15: Insert sketch

The system allows the user to insert images created by means of other software or allows the user to create the sketches with e-CUSTOM platform. The user saves his/her sketch. The system stores the sketch. The e-CUSTOM system is able to univocally associate provided sketches to the specific user.

4.2.17 Use Case UC16: Update manufacturing information (OEM, Suppliers, Dealers) and elaborate environmental data

The system allows loading information about OEM and suppliers’ plants. For instance the information could be name of the plan, location, productive capacity, production cost, and environmental information.

The system allows loading information about dealer. For instance the information could be name of the dealer, location, capacity to do special works (i.e.: assembling kits, etc.)

The information about OEM, suppliers and dealers are stored in database, which can be updated from OEM. Kilometrical distances between OEM, suppliers and dealers are registered.

Another set of information is related to environmental impact. The system incorporates a method for the evaluation of environmental impact which is based on an evaluation in terms of production, transportation and localization. For each alternative features associated to the different accessories, the system estimates an environmental impact index based on *production* parameters evaluation. The environmental index should be a single value or be a set of different parameters. The system allows storing data for the environmental evaluation index. The data are referring to each alternative features and to a reference object. The reference object is the basis for the environmental impact comparison. The e-CUSTOM system visualizes the environmental impact for each alternative features associated to the different accessories. The system estimates an environmental impact index based on *transportation* parameters. For instance the kilometrical distance and means of transport can be taken into account. The system estimates an environmental impact index based on *localization* parameters. According to the plant location, national energetic mix tables can be taken into account.

4.2.18 Use Case UC17: Take production / assembling decision

The system should have the ability to identify the best production/assembly solution for the accessory between make (the OEM decides to produce/assemble the accessory internally) and buy (the OEM decides to outsource the production/assembly of the accessory). The system should provide an investment analysis with the evaluation of economical indexes (i.e. Net Present Value, Internal Rate of Return). The OEM inserts information related to investment analysis and the system stores it. . The selection of the best productive and assembling solution (MAKE or BUY) is based on production cost, transportation cost, requested volumes and environmental impact. The OEM selects his favorite solution from production point of view and the same from assembling point of view.

4.2.19 Use Case UC18: Supply chain configuration

The developed method should support OEM in supply chain optimization, in order to identify the plants (supplier or internal ones) in charge to produce / assemble the different components and, eventually, the dealer in charge to assemble them.

In function of different input data (productive capacity, productive costs, transportation costs, market demands, markets localization, etc.), a supply chain configuration is provided in terms of:

- identification of supplier and/ or internal plants
- allocation of productive quantities for each identified plant.

4.3 Step 2 - Formalization of operational processes with modelling tools

The activities, will be described (or referred from D1.1 or D1.2 previous sections)

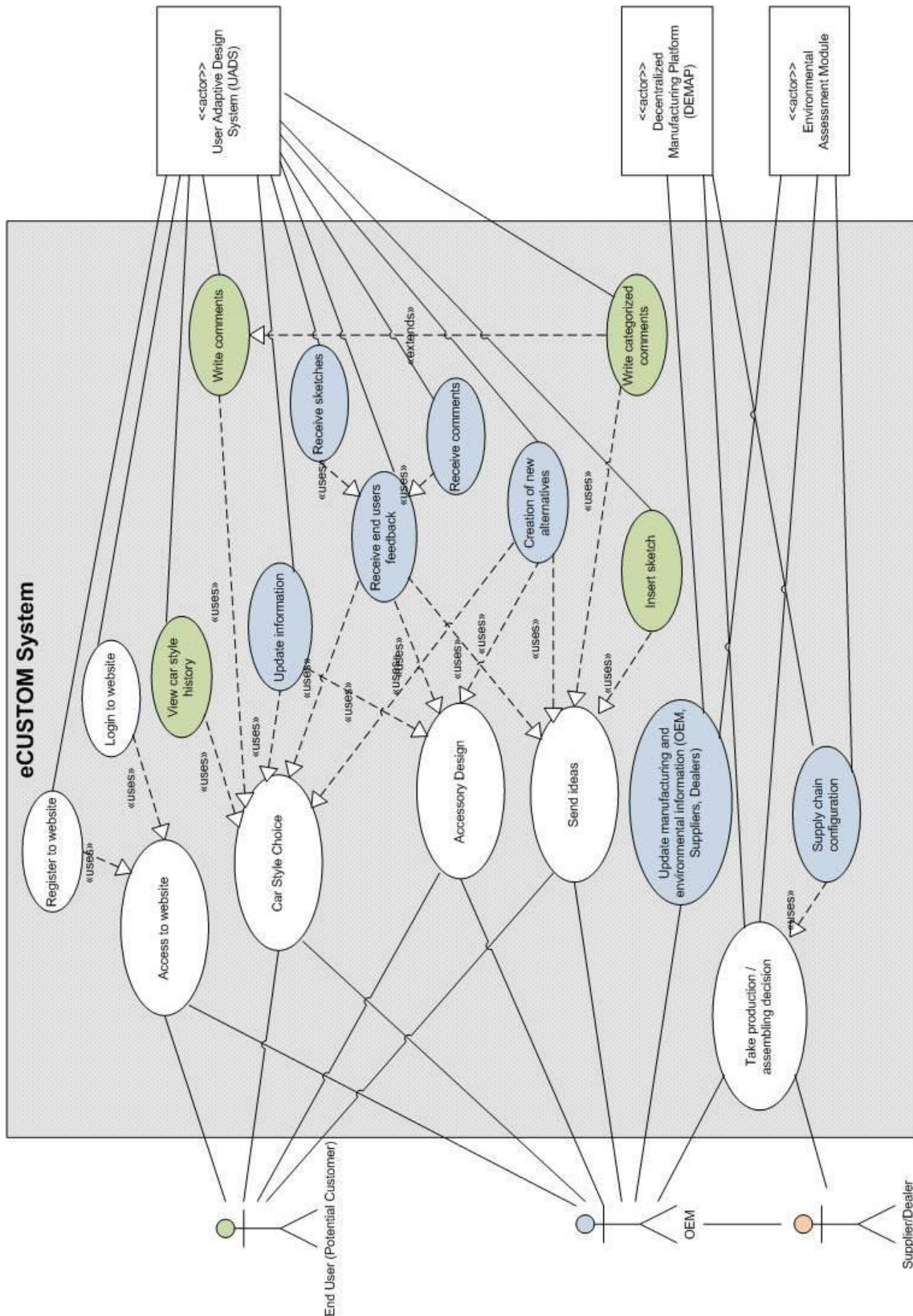


Figure 1: Automotive Case -Use Cases Diagram-

4.3.1 Use Case UC1: Access to website

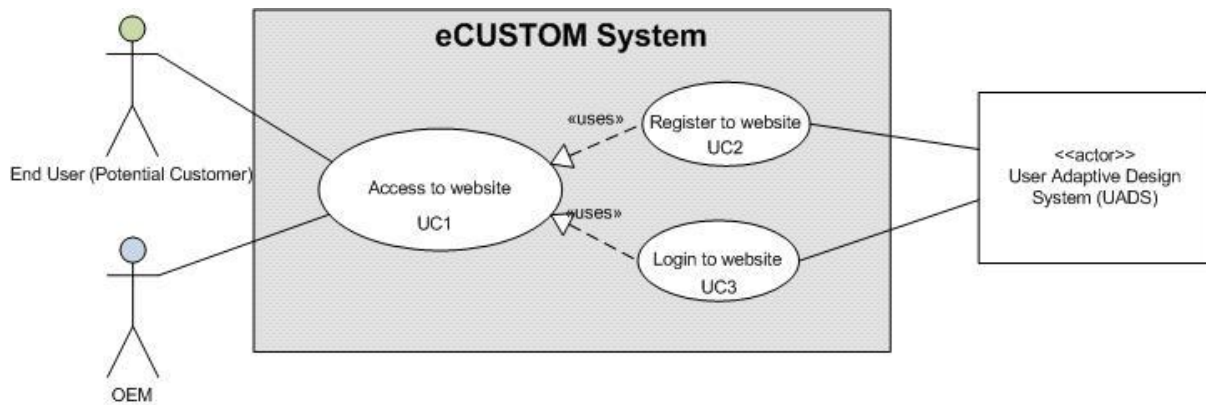


Figure 2: Access to website Use Case Diagram

Use Case ID	UC1
Use Case Name	Access to website
Goal/Purpose:	Perform an access control to the e-CUSTOM system demanding the user to register and login.
Actors	Main actors: End user (Potential customer), OEM Secondary actors: UADS
Preconditions and Post conditions	Not required
Main Success Scenario (or Basic Flow):	<i>End user activities:</i>
	<ol style="list-style-type: none"> 1. The customer goes to the e-CUSTOM application 2. e-CUSTOM system ask the customer to select between two choices: Register or Login 3. If the customer is new, he/she selects to register. (<i>Go to UC2</i>) 4. If it is not the first time to the user in the website and he/she already owns login and password, he/she selects to login (<i>Go to UC3</i>)
	<i>OEM activities:</i>
	<ol style="list-style-type: none"> 1. The OEM goes to the e-CUSTOM application 2. e-CUSTOM system shows the main page with the options to register and to login. 3. The OEM chooses to login (<i>Go to UC3</i>)

Table 4: Use Case 1 Description

4.3.2 Use Case UC2: Register to website

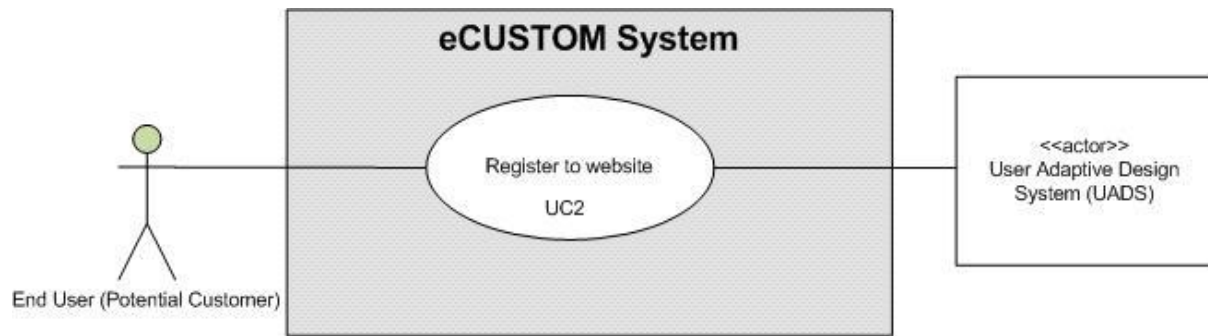


Figure 3: Register to website Use Case Diagram

Use Case ID	UC2
Use Case Name	Register to website
Goal/Purpose:	Collect personal data of new users
Actors	Main actors: End user (Potential customer), OEM, etc. Secondary actors: UADS
Preconditions and Postconditions	Not required
Main Success Scenario (or Basic Flow):	<ol style="list-style-type: none"> 1. e-CUSTOM system shows an empty registration form asking the following: <ul style="list-style-type: none"> • Name • Surname • Female/Male • Country • Age • Occupation • E-mail • Possession of FIAT car? [yes/no] 2. The user fill in the form (some fields are optional) and confirm. 3. e-CUSTOM system provides (by e-mail) to the user a login and a password 4. e-CUSTOM system stores user registration data

Table 5: Use Case 2 Description

4.3.3 Use Case UC3: Login to website

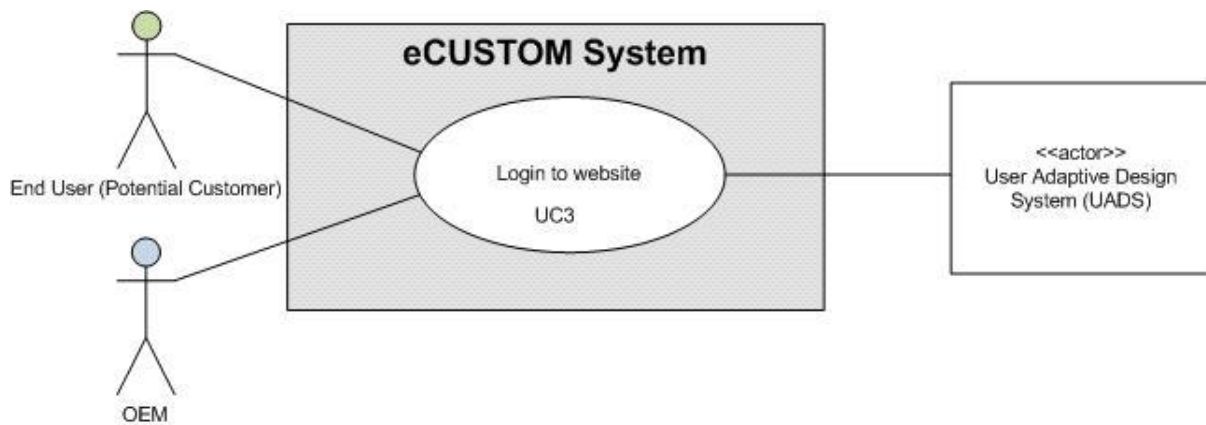


Figure 4: Login to website Use Case Diagram

Use Case ID	UC3
Use Case Name	Login to website
Goal/Purpose:	Identify and authenticate a user before access to e-CUSTOM application
Actors	Main actors: End user (Potential customer), OEM Secondary actors: UADS
Preconditions and Postconditions	The end user has to be registered and own login and password combination provided by e-CUSTOM system
Main Success Scenario (or Basic Flow):	<ol style="list-style-type: none"> 1. e-CUSTOM system asks for login and password combination 2. The user/OEM fill in the fields and validate 3. e-CUSTOM system checks that the combination provided exists within the users/OEMs database. 4. a) If the information is wrong (user/OEM does not exist) the system informs the user of the error and asks again for the credentials. If the main actor has forgot his/her credentials password recovery option is available(<i>Go to UC2</i>) b) If the login is successful. The user/OEM is identified and a new session is started to e-CUSTOM application home page, which offers the possibility to participate in customization process offering three options: <ol style="list-style-type: none"> a. “Car Style choice” (<i>Go to UC4</i>) b. “Accessory Design”(Go to UC8) c. “Send us your ideas” (<i>Go to UC13</i>) <p>The OEM has also the ability to access the manufacturing and environmental sessions (<i>Go to UC16 and Go to UC17</i>)</p> 5. The user selects an option

Table 6: Use Case 3 Description

4.3.4 Use Case UC4: Car Style choice

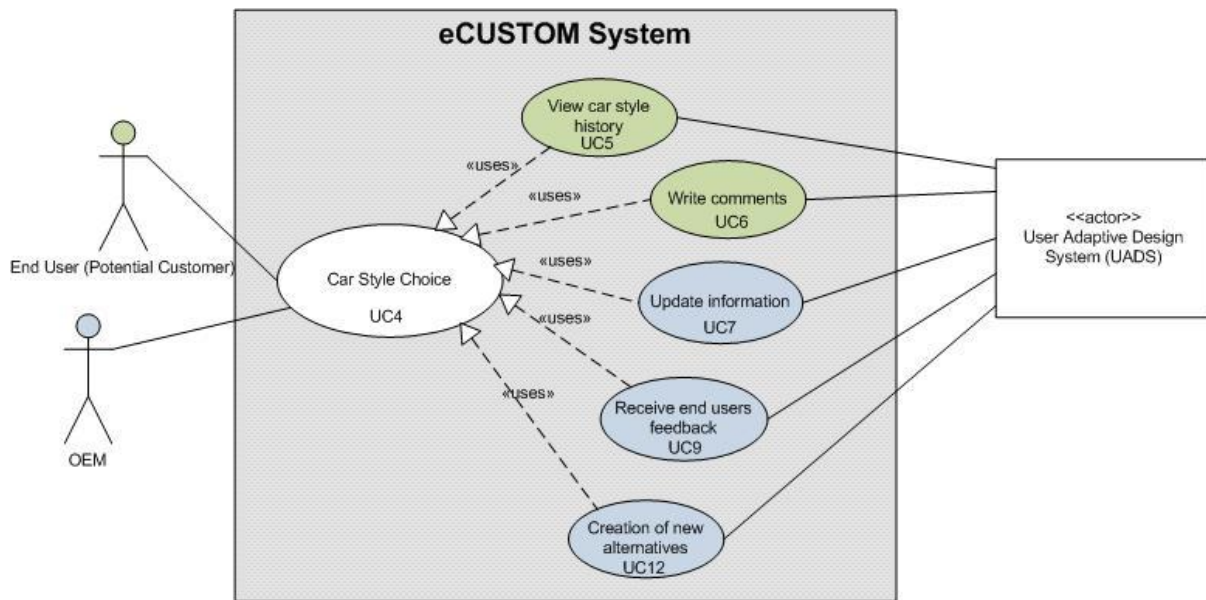


Figure 5: Car Style Choice Use Case Diagram

Use Case ID	UC4
Use Case Name	Car Style choice
Goal/Purpose:	Provide an interface between the end users and OEMs to collaborate in the design process of car style
Actors	Main actors: End user (Potential customer), OEM Secondary actors: UADS
Preconditions and Postconditions	At the beginning of the process, the number of different options can be high, but it is reducing according to the process progress; besides, the level of details of the proposed model becomes greater.
Main Success Scenario (or Basic Flow):	<ol style="list-style-type: none"> The e-CUSTOM system visualizes the home page including the following information: <ul style="list-style-type: none"> FIAT model name Current stage of FIAT car style process Expiration date for the participation to car style session Potential notes/comments (e.g. “At the moment the current phase of car style choice is closed. Fiat is elaborating your previous feedbacks”) Date for the reopening of the next car style session. The e-CUSTOM system also visualizes a certain number of style alternatives For each alternative the system visualizes some different figures (AR/VR interface if available)

	<p><i>End user activities:</i></p> <ol style="list-style-type: none"> 4. The end user selects one alternative as his/her favorite and e-CUSTOM system stores user's selection and associate him/her univocally as the author. 5. The e-CUSTOM system allows the user to see the results of previous steps of car style session (<i>Go to UC5</i>). 6. The e-CUSTOM system allows the user to expresses his/her preferences through writing comments (<i>Go to UC6</i>) 7. After the comments/selection e-CUSTOM system asks the user if: <ol style="list-style-type: none"> a. He/she wants to modify his/her selection/comment (return to "Car Style Choice" home page) b. He/she wants to participate to another session (return to e-CUSTOM application home page) c. He/she wants to quit the application. 8. The user selects his/her choice. <p><i>OEM activities:</i></p> <ol style="list-style-type: none"> 9. Car Style choice expiration date is gone 10. e-CUSTOM system elaborates users' feedbacks in terms of expressed preferences and comments (<i>Go to UC9</i>) 11. e-CUSTOM system sends end users' feedbacks to OEM 12. e-CUSTOM system updates data in car style choices home page (potential notes/comments and date for reopening if available) 13. e-CUSTOM system allows the OEM to update information (<i>Go to UC7</i>) 14. e-CUSTOM system allows the OEM to create new style alternatives (<i>Go to UC12</i>) 15. The OEM closes the styling process 16. e-CUSTOM system contacts by e-mail the registered users in order to inform them that a new car style session has opened
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Table 7: Use Case 4 Description

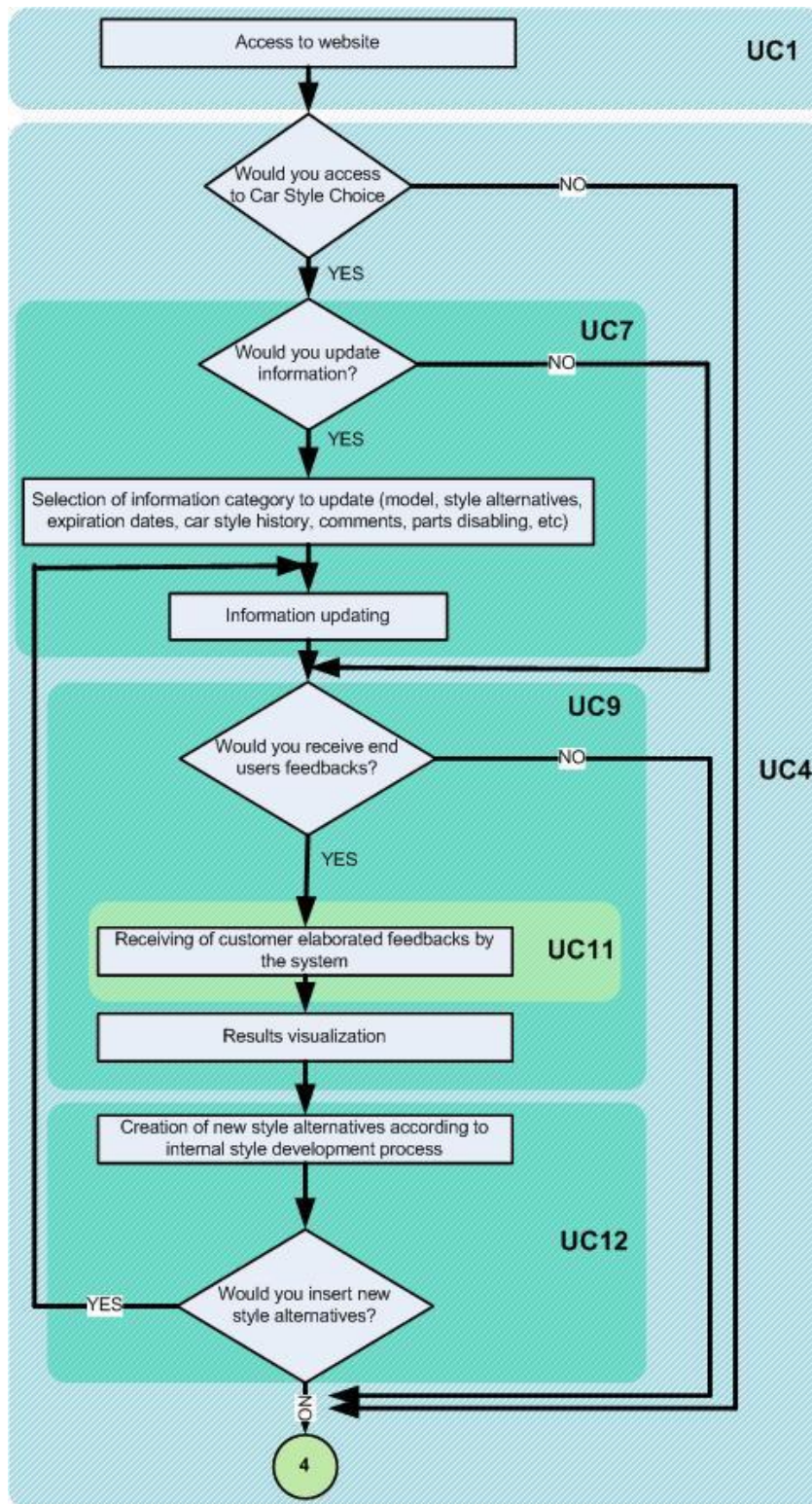


Figure 6: Activity Diagram of OEM tasks(1/6)

4.3.5 Use Case UC5: View car style history

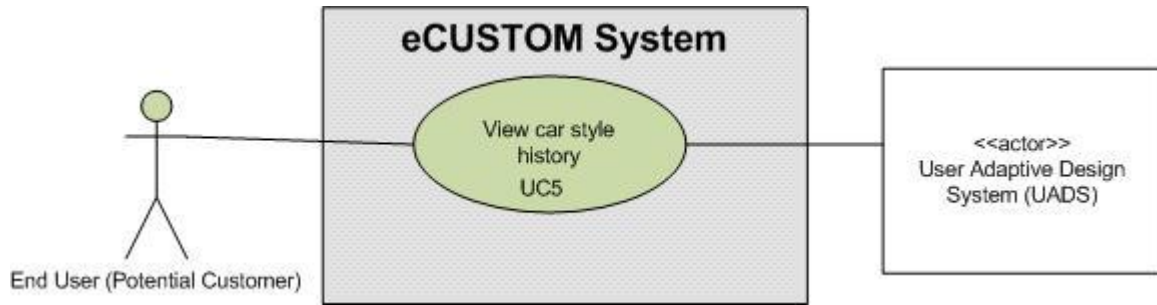


Figure 7: View Car Style history Use Case Diagram

Use Case ID	UC5
Use Case Name	View car style history
Goal/Purpose:	Visualize the results of previous car style sessions
Actors	Main actors: End user (Potential customer) Secondary actors: UADS
Preconditions and Postconditions	If it's the first step of the process this functionality is disabled
Main Success Scenario (or Basic Flow):	1. e-CUSTOM system shows an interface with the previous steps of the results

Table 8: Use Case 5 Description

4.3.6 Use Case UC6: Write comments

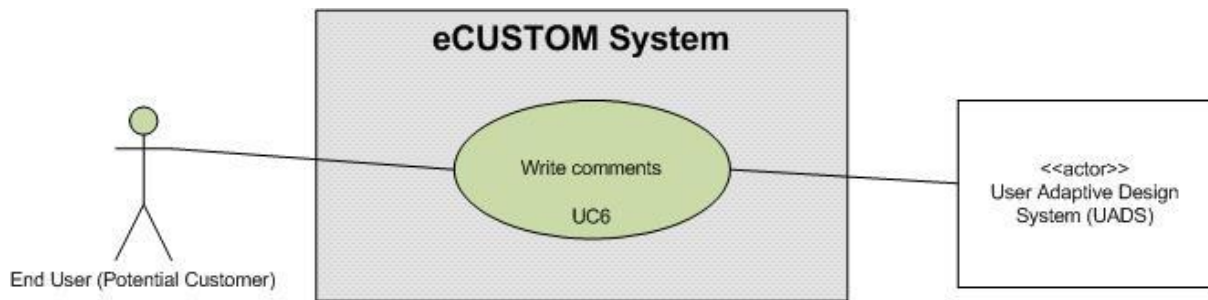


Figure 8: Write comments Use Case Diagram

Use Case ID	UC6
Use Case Name	Write comments
Goal/Purpose:	Collect potential customers' positive/negative considerations about the alternatives
Actors	Main actors: End user (Potential customer) Secondary actors: UADS

Preconditions and Postconditions	
Main Scenario (or Basic Flow):	<ol style="list-style-type: none">1. e-CUSTOM system allows the user to write comments in a dedicated window2. The user define his/her opinion to be positive or negative (like/dislike)3. The user writes the comment and validate4. e-CUSTOM system stores the comment as strength or weakness point and associates the user univocally as the author.

Table 9: Use Case 6 Description

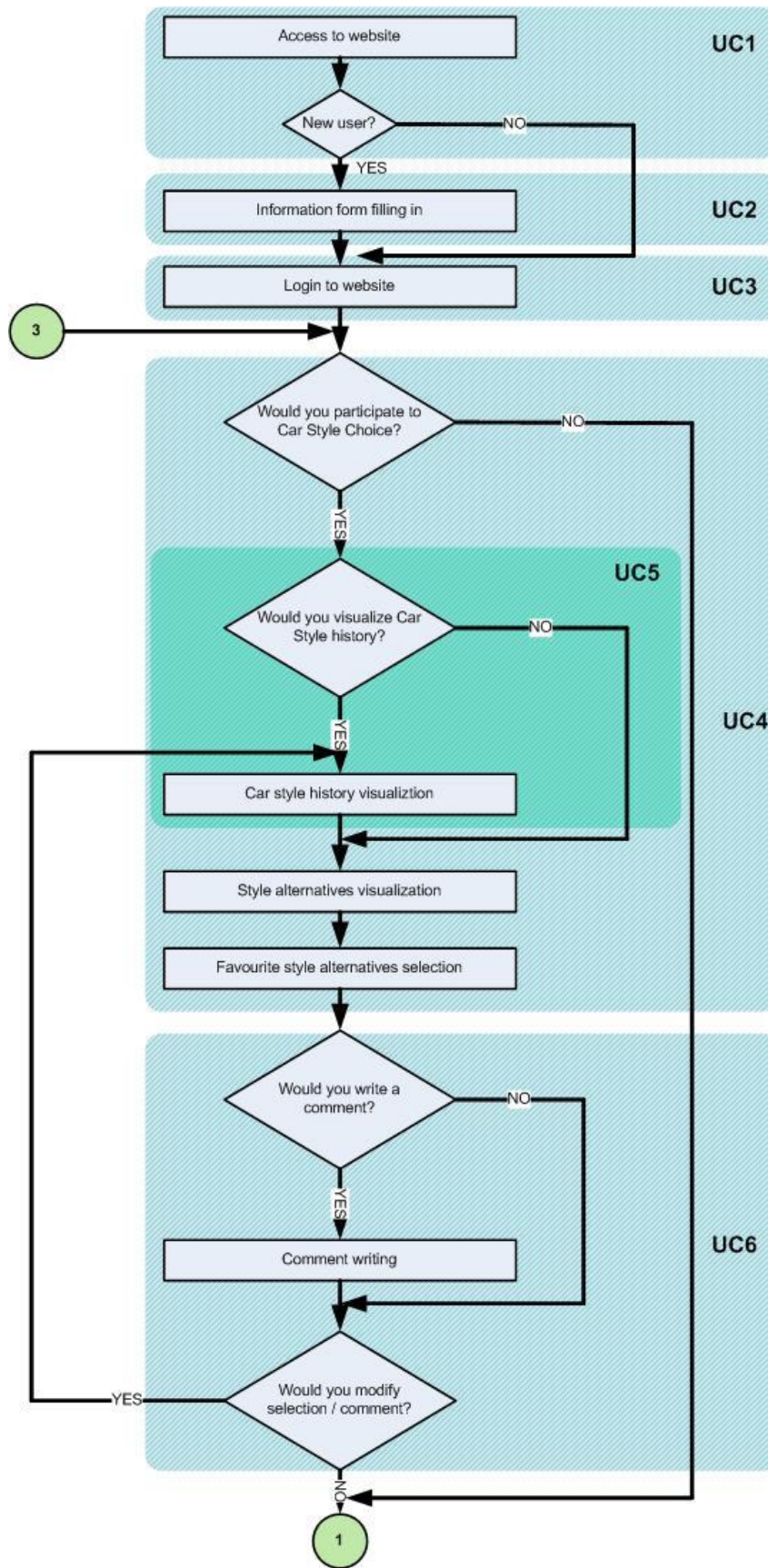


Figure 9: Activity Diagram of End user tasks(1/3)

4.3.7 Use Case UC7: Update information

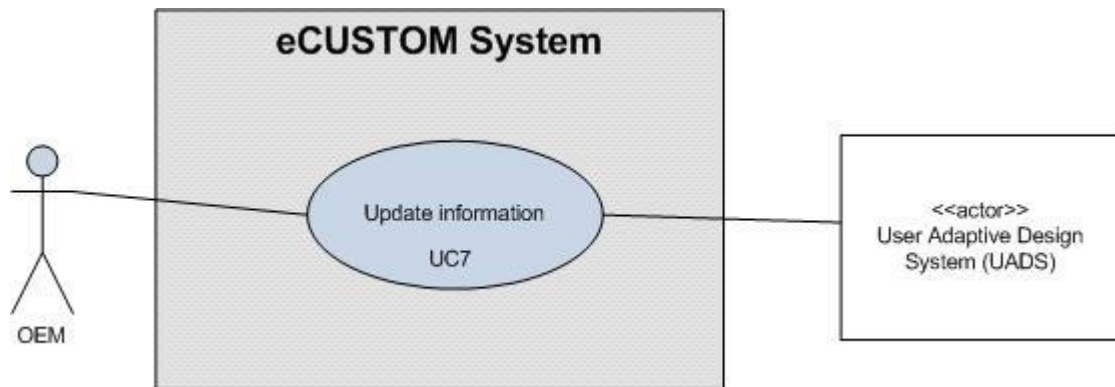


Figure 10: Update information Use Case Diagram

Use Case ID	UC7
Use Case Name	Update information
Goal/Purpose:	Provide an interface to the OEM to update e-CUSTOM application data
Actors	Main actors: OEM Secondary actors: UADS
Preconditions and Postconditions	Information updating can be reached from Car Style Choice and from Accessory Design
Main Success Scenario (or Basic Flow):	<p><i>From Car Style Choice:</i></p> <ol style="list-style-type: none"> 1. The OEM selects the information category to update between: <ul style="list-style-type: none"> • Model • Style alternatives • New expiration date • Car style history • Potential notes/comments • Parts disabling 2. The OEM upload new update <p><i>From Accessory Design:</i></p> <ol style="list-style-type: none"> 3. The OEM selects the information category to update between: <ul style="list-style-type: none"> • Accessories • Features of each accessory • Options for each feature 4. The OEM upload new updates in terms of quantity, names, images and environmental impact

Table 10: Use Case 7 Description

4.3.8 Use Case UC8: Accessory Design

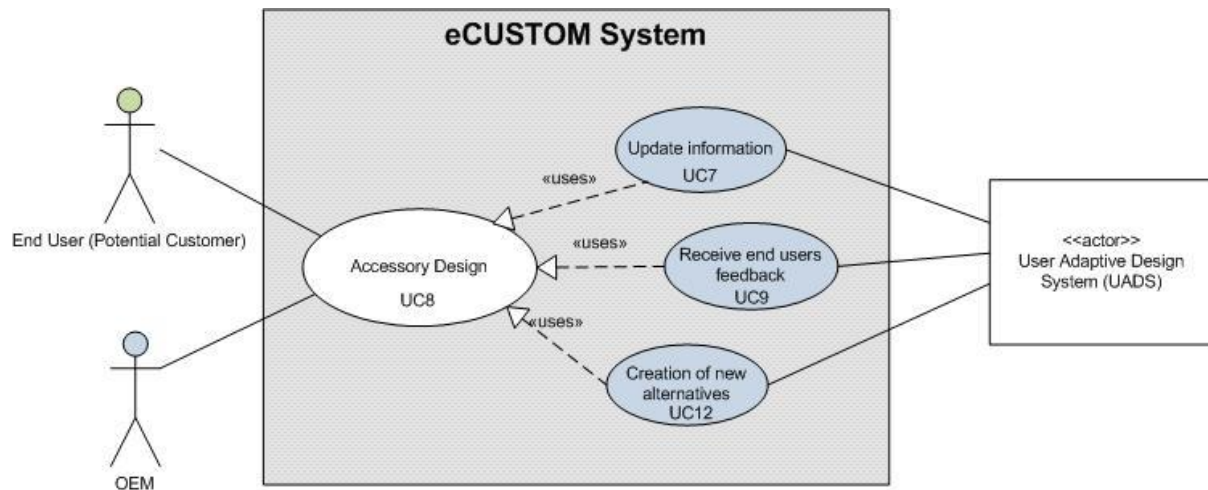


Figure 11: Accessory Design Use Case Diagram

Use Case ID	UC8
Use Case Name	Accessory Design
Goal/Purpose:	Provide an interface between the end users and OEMs to collaborate in the design process of accessories
Actors	Main actors: End user (Potential customer), OEM Secondary actors: UADS
Preconditions and Postconditions	
Main Scenario (or Basic Flow):	<p><i>End user activities:</i></p> <ol style="list-style-type: none"> 1. The e-CUSTOM system visualizes the home page including a list of accessories (name and image). 2. The end user selects an accessory 3. the e-CUSTOM system visualizes a set of features for the selected accessory 4. The end user selects the feature 5. e-CUSTOM system visualizes some options in the form of descriptions and/or images.(If available, AR/VR interfaces are used to visualize the part in an enhanced manner) 6. e-CUSTOM system visualizes an environmental impact index 7. The end user selects the favorite feature alternative. 8. For each feature alternative the user can select different options 9. e-CUSTOM system stores user's selection and is able to univocally associate provided selection to the specific user 10. e-CUSTOM system asks the user if: <ol style="list-style-type: none"> a. He/she wants to quit from the designing of the specific accessory (return to the "Accessory design" home page)

	<ul style="list-style-type: none"> b. He/she wants to participate to other session (return to e-CUSTOM application home page) c. He/she wants to quit the application. <p>11. The user selects his/her choice.</p>
	<p><i>OEM activities:</i></p> <ul style="list-style-type: none"> 12. e-CUSTOM system collects a certain number of users' feedback regarding accessory design, or the OEM requests e-CUSTOM system to elaborate users' feedbacks 13. e-CUSTOM system elaborates data for each accessory (<i>Go to UC9</i>) 14. e-CUSTOM system sends elaborated data to OEM 15. e-CUSTOM system allows the OEM to update information (<i>Go to UC7</i>) 16. e-CUSTOM system allows the OEM to create new style alternatives (<i>Go to UC12</i>) 17. The OEM closes the accessory design process 18. e-CUSTOM system contacts by e-mail or the OEM updates the "News" section the registered users in order to inform them that new accessories/features/options have been inserted

Table 11: Use Case 8 Description

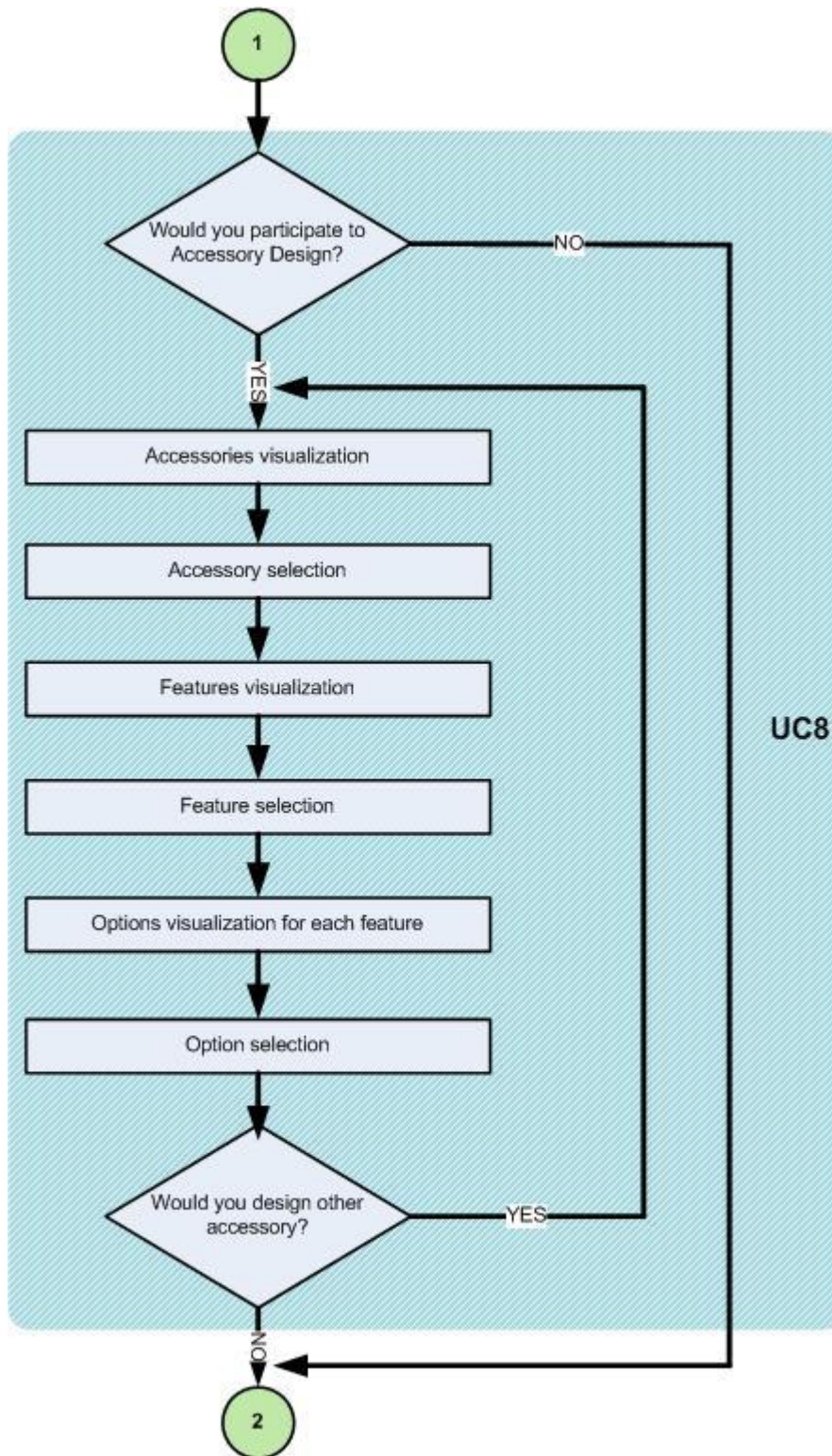


Figure 12: Activity Diagram of End user tasks (2/3)

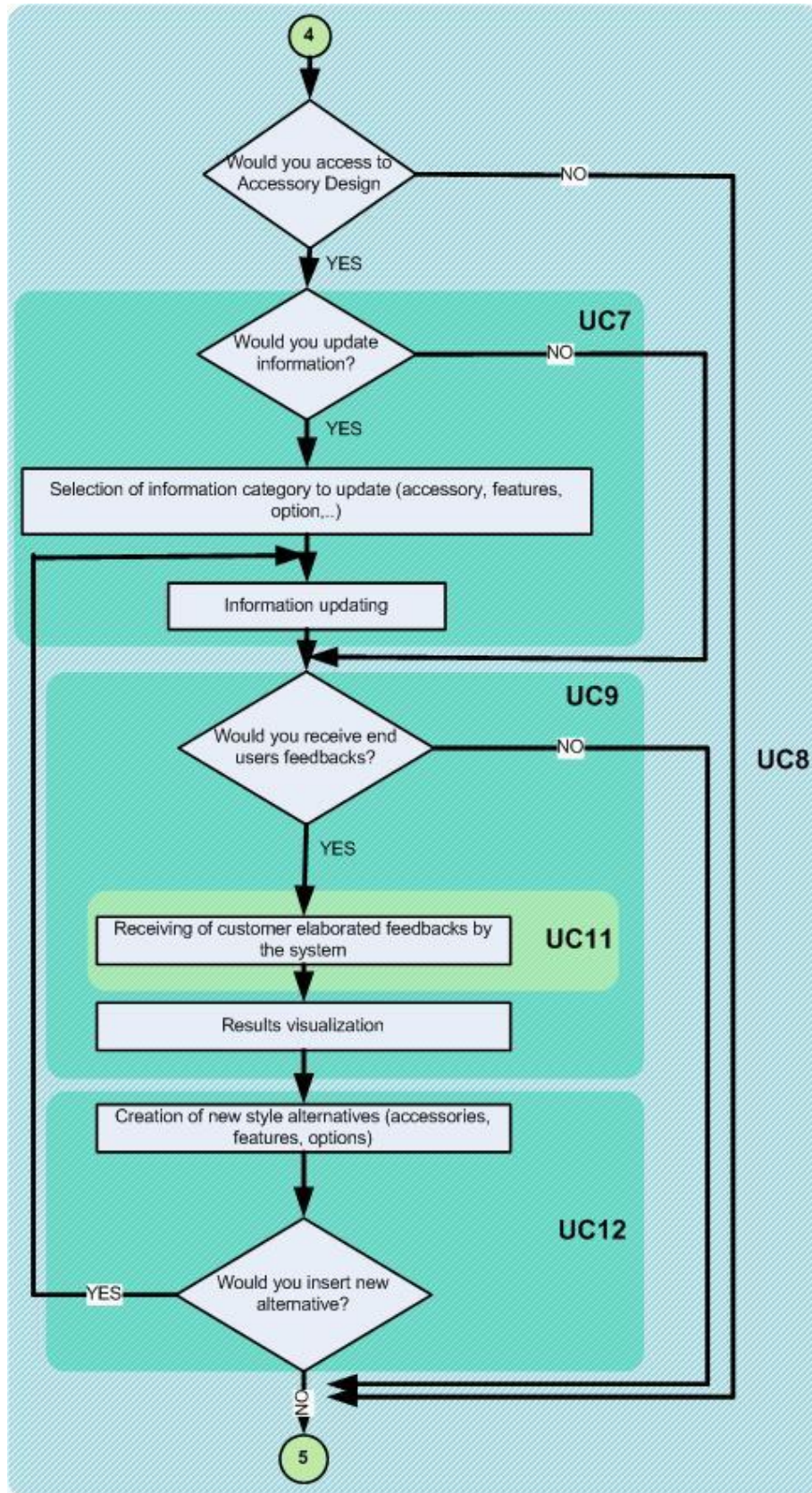


Figure 13: Activity Diagram of OEM tasks(2/6)

4.3.9 Use Case UC9: Receive end users feedback

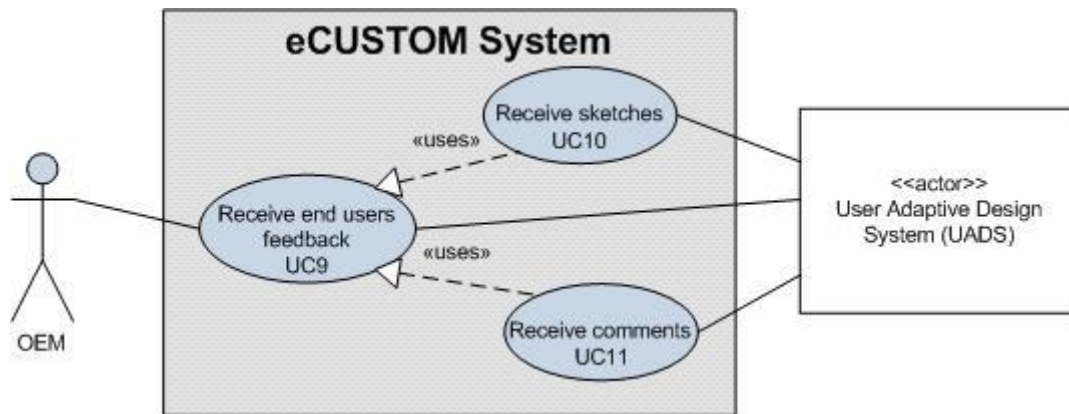


Figure 14: Receive end users feedback Use Case Diagram

Use Case ID	UC9
Use Case Name	Receive end users feedback
Goal/Purpose:	Recollect all the users contributions and elaborate them to extract results
Actors	Main actors: OEM Secondary actors: UADS
Preconditions and Postconditions	End user feedback activity can be reached from Car Style Choice, Accessory Design or Send ideas
Main Scenario (or Basic Flow):	<p><i>From Car Style Choice:</i></p> <ol style="list-style-type: none"> 1. Car Style choice expiration date is gone 2. e-CUSTOM system elaborates users' feedbacks in terms of expressed preferences and comments (<i>Go to UC11</i>) according to a method that has to be defined. <p><i>From Accessory Design:</i></p> <ol style="list-style-type: none"> 3. After a certain number of customized accessories is reached or behind OEM request, the elaboration process begins 4. e-CUSTOM system elaborates the results according to a method that has to be defined <p><i>From Send Ideas:</i></p> <ol style="list-style-type: none"> 5. e-CUSTOM system collects a certain number of users' sketches (<i>Go to UC10</i>) and categorized comments (<i>Go to UC11</i>) or the OEM request 6. e-CUSTOM system elaborates the sketches results according to a method that has to be defined

Table 12: Use Case 9 Description

4.3.10 Use Case UC10: Receive sketches

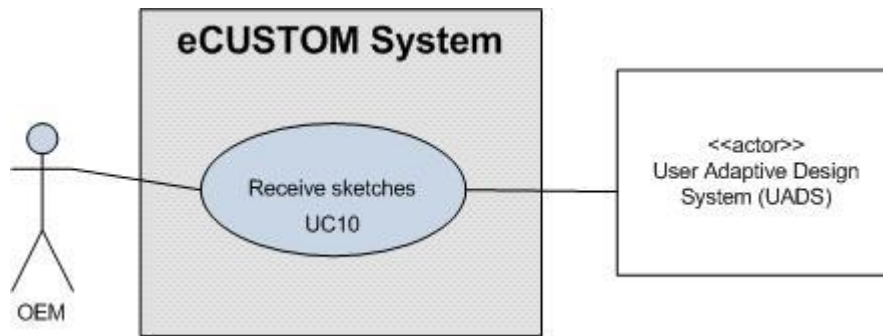


Figure 15: Receive Sketches Use Case Diagram

Use Case ID	UC10
Use Case Name	Receive sketches
Goal/Purpose:	Collect all the uploaded sketches and send to the OEM
Actors	Main actors: OEM Secondary actors: UADS
Preconditions and Postconditions	A certain number of sketches could be defined to trigger the elaboration of results
Main Success Scenario (or Basic Flow):	<ol style="list-style-type: none"> 1. The system allows the OEM to request all the uploaded sketches 2. The system collects all the uploaded sketches and sends them to the OEM

Table 13: Use Case 10 Description

4.3.11 Use Case UC11: Receive comments

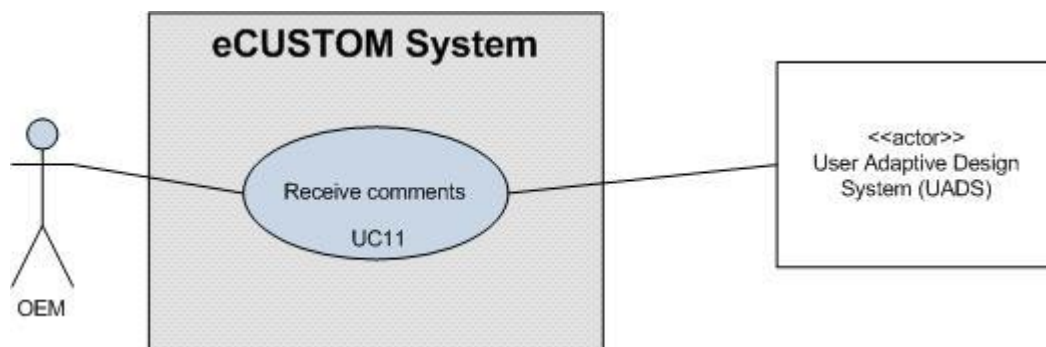


Figure 16: Receive comments Use Case Diagram

Use Case ID	UC11
Use Case Name	Receive comments
Goal/Purpose:	Collect all the uploaded comments and send them to the OEM
Actors	Main actors: OEM Secondary actors: UADS

Preconditions and Postconditions	
Main Success Scenario (or Basic Flow):	<ol style="list-style-type: none"> 1. The system allows the OEM to request all the uploaded comments 2. The system collects all the uploaded comments and send them to the OEM

Table 14: Use Case 11 Description

4.3.12 Use Case UC12: Creation of new alternatives

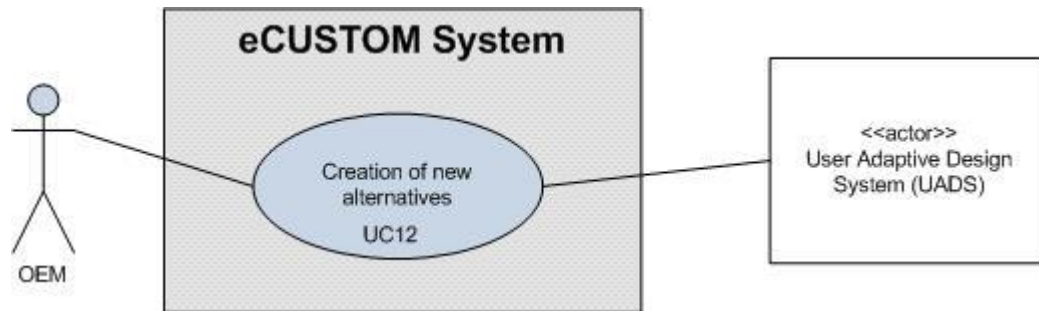


Figure 17: Creation of new alternatives Use Case Diagram

Use Case ID	UC12
Use Case Name	Creation of new alternatives
Goal/Purpose:	Create new alternatives based on the user feedback analysis
Actors	Main actors: OEM Secondary actors: UADS
Preconditions and Postconditions	Creation of new alternatives activity can be reached from Car Style Choice, Accessory Design or Send ideas
Main Success Scenario (or Basic Flow):	<ol style="list-style-type: none"> 1. The OEM performs an evaluation of end user feedbacks results 2. The OEM create new style alternatives or accessories according to the internal development process and visualizes photorealistic sketches 3. The OEM updates the alternatives

Table 15: Use Case 12 Description

4.3.13 Use Case UC13: Send ideas

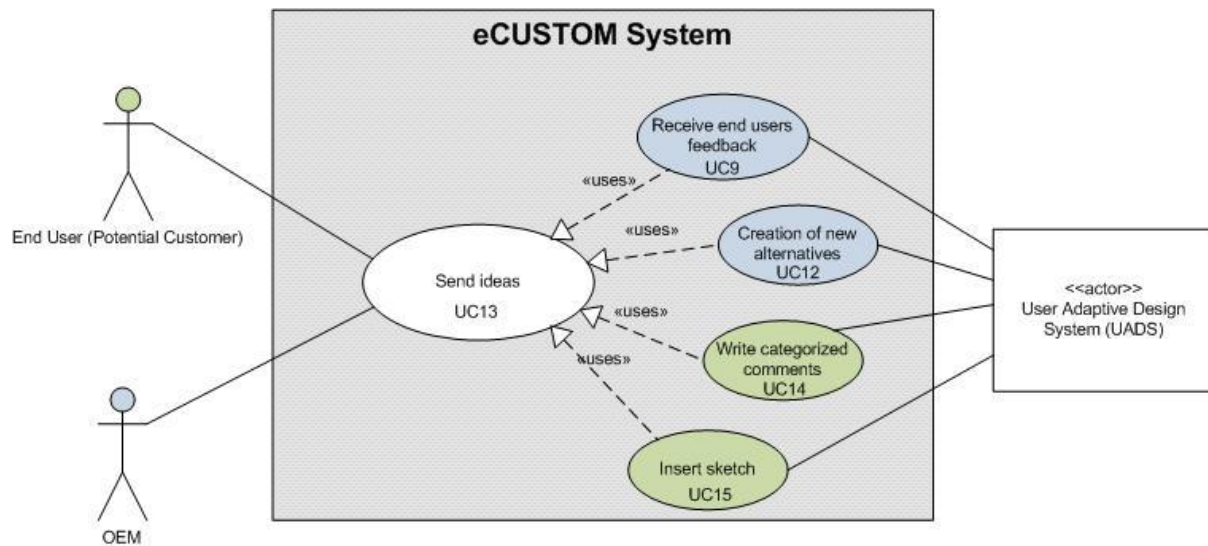


Figure 18: Send ideas Use Case Diagram

Use Case ID	UC13
Use Case Name	Send ideas
Goal/Purpose:	Provide an interface to collect end user sketches, designs and general comments
Actors	Main actors: End user (Potential customer), OEM Secondary actors: UADS
Preconditions and Postconditions	
Main Success Scenario (or Basic Flow):	<p><i>End user activities:</i></p> <ol style="list-style-type: none"> 1. The e-CUSTOM system visualizes the home page 2. The system allows the user to <ol style="list-style-type: none"> a. insert his/her own sketches (<i>Go to UC15</i>) b. insert categorized comments (<i>Go to UC14</i>) 3. The end user makes his/her selection 4. e-CUSTOM system asks the user if: <ol style="list-style-type: none"> a. He/she wants to insert another sketch, or insert another comment (return to the “Send ideas” home page) b. He/she wants to participate to other session (return to e-CUSTOM application home page) c. He/she wants to quit the application. 5. The user selects his/her choice. <p><i>OEM activities:</i></p>

	<ol style="list-style-type: none">6. e-CUSTOM system collects a certain number of users' sketches, or the OEM request sketches7. the system sends the sketches to the OEM (<i>Go to UC9</i>)8. e-CUSTOM system allows the OEM to create new style alternatives (<i>Go to UC12</i>)9. e-CUSTOM system collects a certain number of users' messages10. e-CUSTOM system sends the comments to OEM structured by category. (<i>Go to UC9</i>)11. The OEM closes the "send ideas" process
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Table 16: Use Case 13 Description

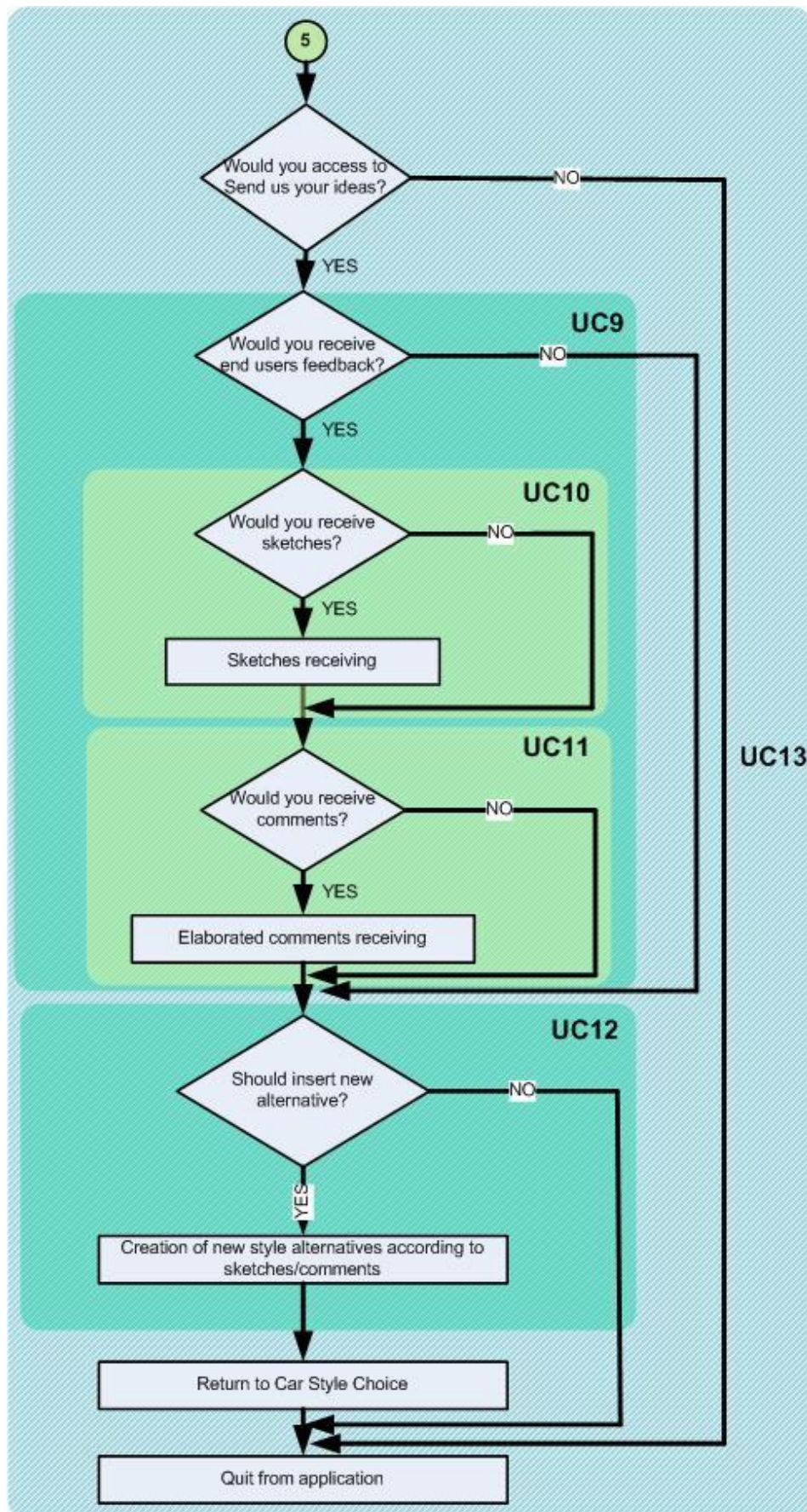


Figure 19: Flow of OEM tasks (manufacturing phase) (3/6)

4.3.14 Use Case UC14: Write categorized comments

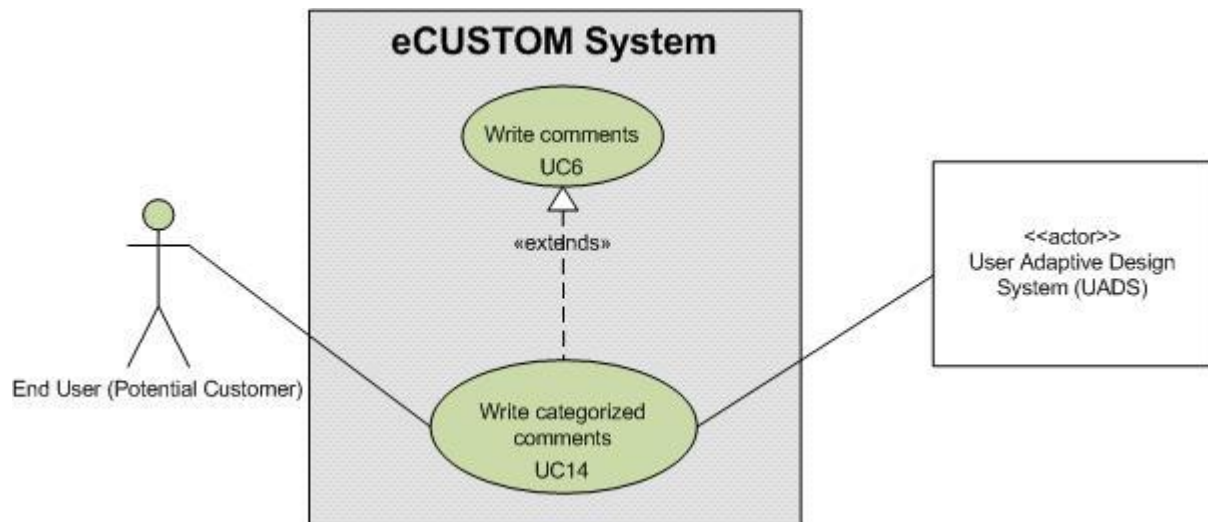


Figure 20: Write categorized comments Use Case Diagram

Use Case ID	UC 14
Use Case Name	Write categorized comments
Goal/Purpose:	Collect potential customers' general suggestions and categorized comments
Actors	Main actors: End user (Potential customer) Secondary actors: UADS
Preconditions and Postconditions	
Main Success Scenario (or Basic Flow):	<ol style="list-style-type: none"> 1. The system requests from the user to select the category of the comment in a dedicated window 2. The user can select between the following categories: <ul style="list-style-type: none"> • Materials • Accessories • Kit • Color • Car design • Propulsion • Others 3. The user selects the category and writes the message. 4. The e-CUSTOM system associate univocally comments to the specific user.

Table 17: Use Case 14 Description

4.3.15 Use Case UC15: Insert sketch

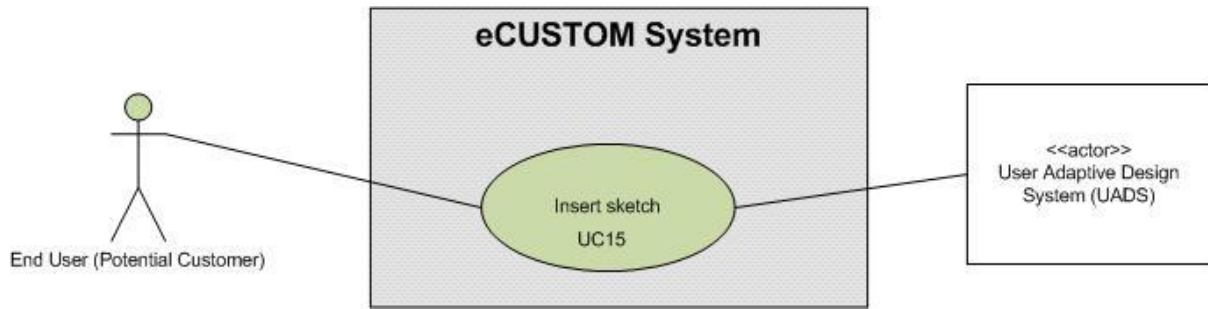


Figure 21: Insert sketch Use Case Diagram

Use Case ID	UC15
Use Case Name	Insert sketch
Goal/Purpose:	Provide an interface to upload sketches proposals
Actors	Main actors: End user (Potential customer) Secondary actors: UADS
Preconditions and Postconditions	
Main Success Scenario (or Basic Flow):	<ol style="list-style-type: none"> 1. The system allows the user to insert images created by means of other software 2. The system allows the user to create the sketches with e-CUSTOM platform. 3. The user saves his/her sketch. 4. The system stores the sketch. 5. The e-CUSTOM system univocally associates provided sketches to the specific user.

Table 18: Use Case 15 Description

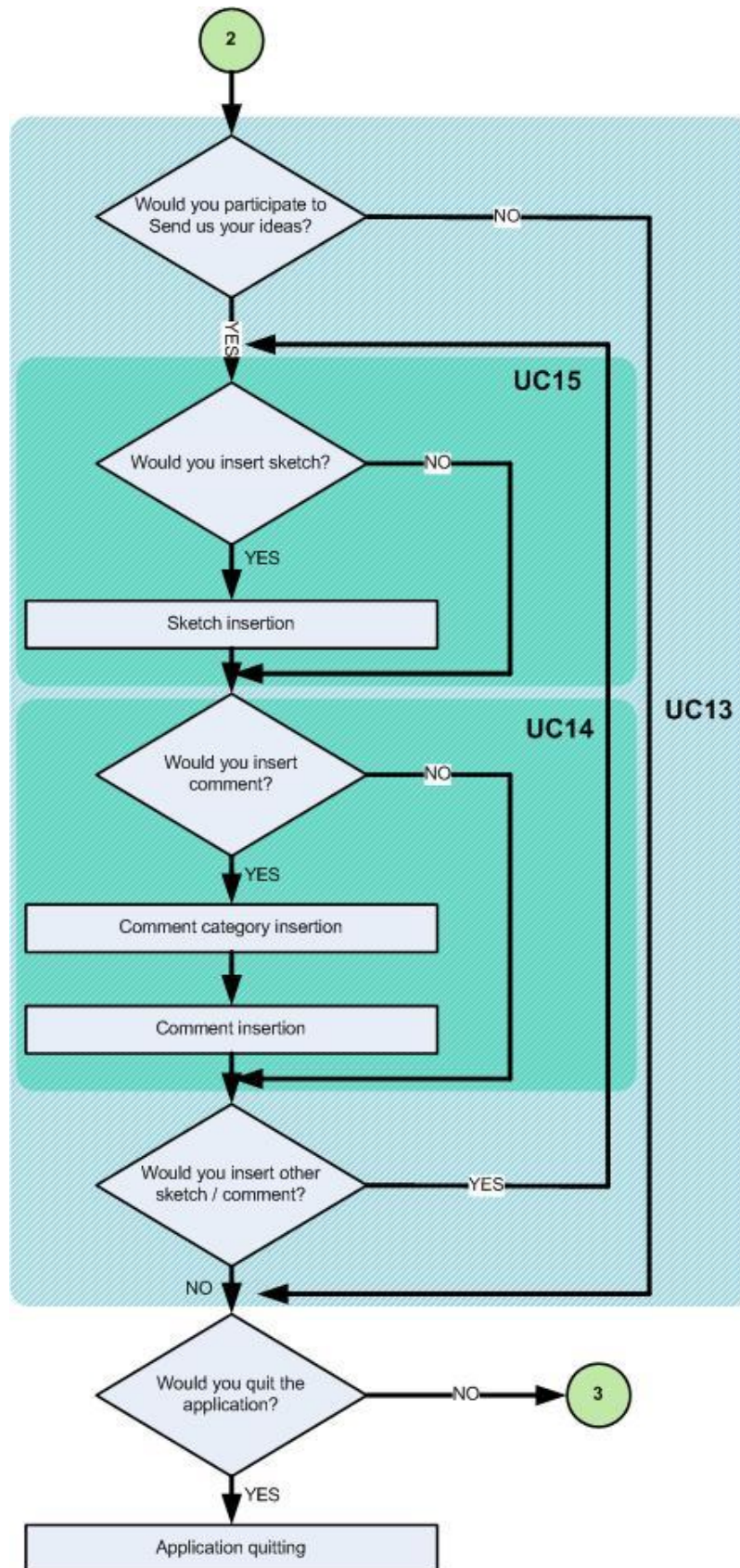


Figure 22: Activity Diagram of End user tasks (3/3)

4.3.16 Use Case UC16: Update manufacturing information and elaborate environmental data

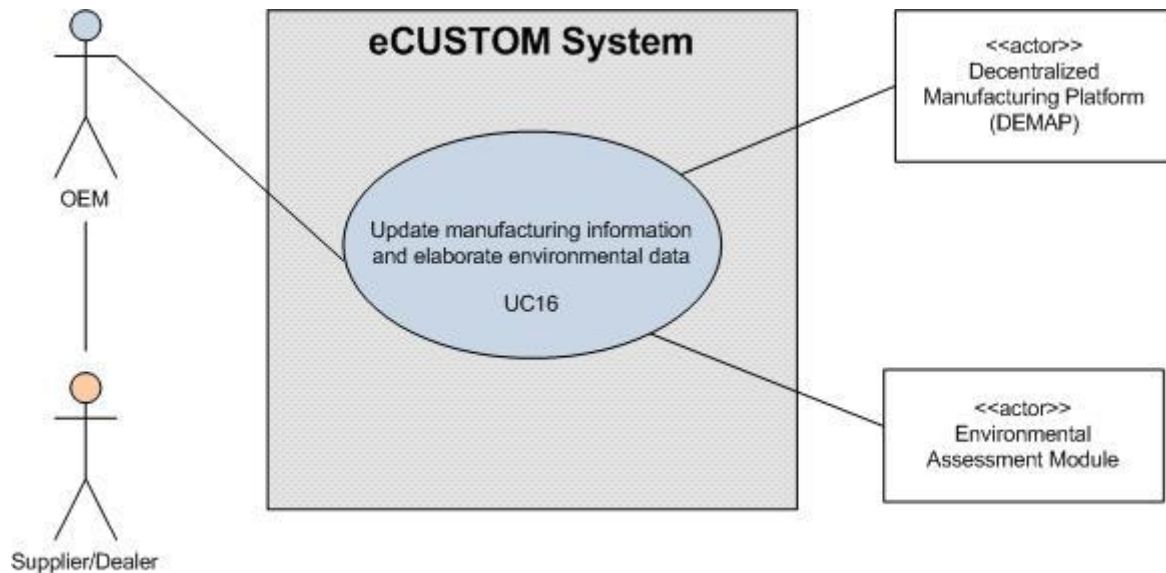


Figure 23: Update manufacturing information and elaborate environmental data.

Use Case Diagram

Use Case ID	UC16
Use Case Name	Update manufacturing information and elaborate environmental data
Goal/Purpose:	Maintain a database with data about OEM, dealers and suppliers to provide information to the DEMAP and Environmental Assessment Module
Actors	Main actors: OEM, Supplier/Dealer Secondary actors: DEMAP, Environmental Assessment Module
Preconditions and Postconditions	
Main Success Scenario (or Basic Flow):	<ol style="list-style-type: none"> 1. Suppliers/ Dealers provide information about them to the OEM 2. e-CUSTOM systems offers to the OEM two choices: <ul style="list-style-type: none"> • to add information • to edit information 3. e-CUSTOM system allows loading the following information about OEM and suppliers' plants: <ul style="list-style-type: none"> • name of the plan • location • productive capacity • production cost • environmental information 4. e-CUSTOM system allows loading information about the dealers:

	<ul style="list-style-type: none">• Name of the dealer• Location• Capacity to do special works (e.g. assembling kits) <ol style="list-style-type: none">5. e-CUSTOM system stores info about kilometrical distances between OEM, suppliers and dealers.6. e-CUSTOM system stores in database the information about OEM, suppliers and dealers.7. For each alternative features associated to the different accessories within e-CUSTOM, the system estimates an environmental impact index based on evaluation of the following parameters:<ul style="list-style-type: none">• Material• Transportation (kilometrical distance and means of transport)• Localization (national energetic mix tables)8. The system stores data for the environmental evaluation indexes.
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Table 19: Use Case 16 Description

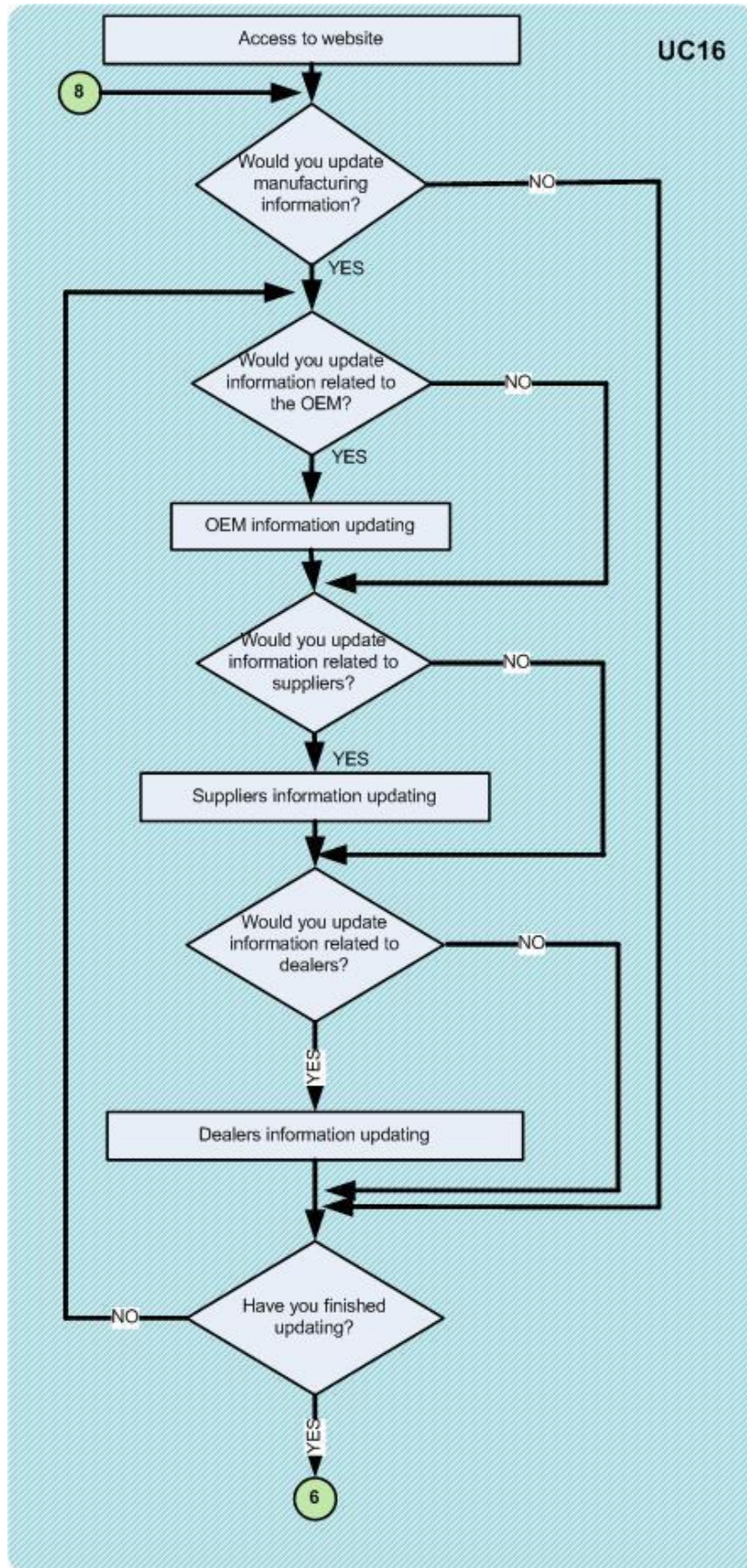


Figure 24: Flow of OEM tasks (manufacturing phase)(4/6)

4.3.17 Use Case UC17: Take production / assembling decision

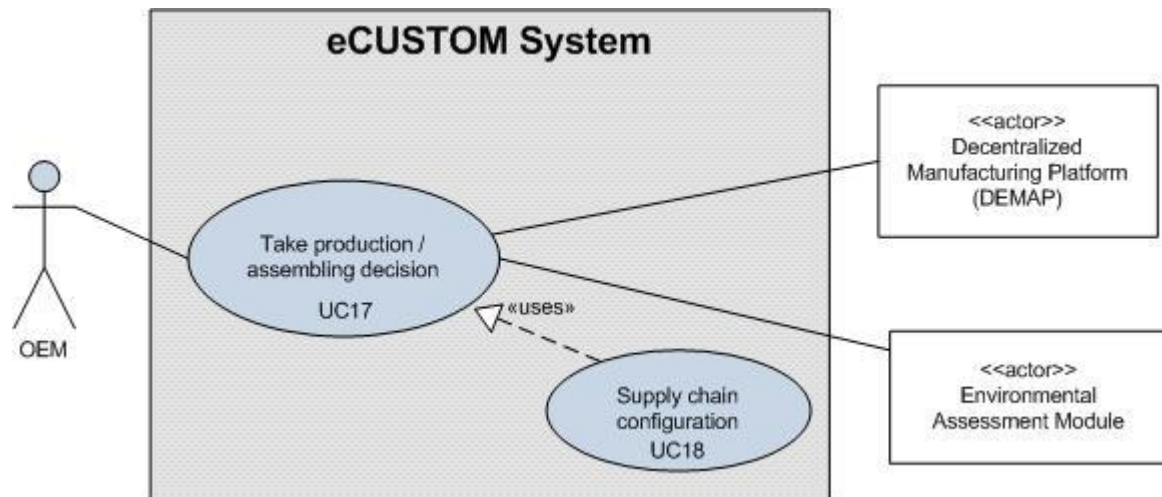


Figure 25: Take production / assembling decision Use Case Diagram

Use Case ID	UC17
Use Case Name	Take production/assembling decision
Goal/Purpose:	Identify the best production/assembly solution for the accessory between make and buy
Actors	Main actors: OEM Secondary actors: DEMAP, Environmental Assessment Module
Preconditions and Postconditions	
Main Success Scenario (or Basic Flow):	<ol style="list-style-type: none"> 1. The OEM inserts information related to investment analysis and e-CUSTOM system stores it. 2. e-CUSTOM system provides an investment analysis with the evaluation of economical indexes (i.e. Net Present Value, Internal Rate of Return). 3. e-CUSTOM system suggests the best productive and assembling solution based on: <ul style="list-style-type: none"> • production cost • transportation cost • requested volumes • environmental impact 4. The OEM selects his favorite solution (MAKE or BUY) from production point of view and the same from assembling point of view.

Table 20: Use Case 17 Description

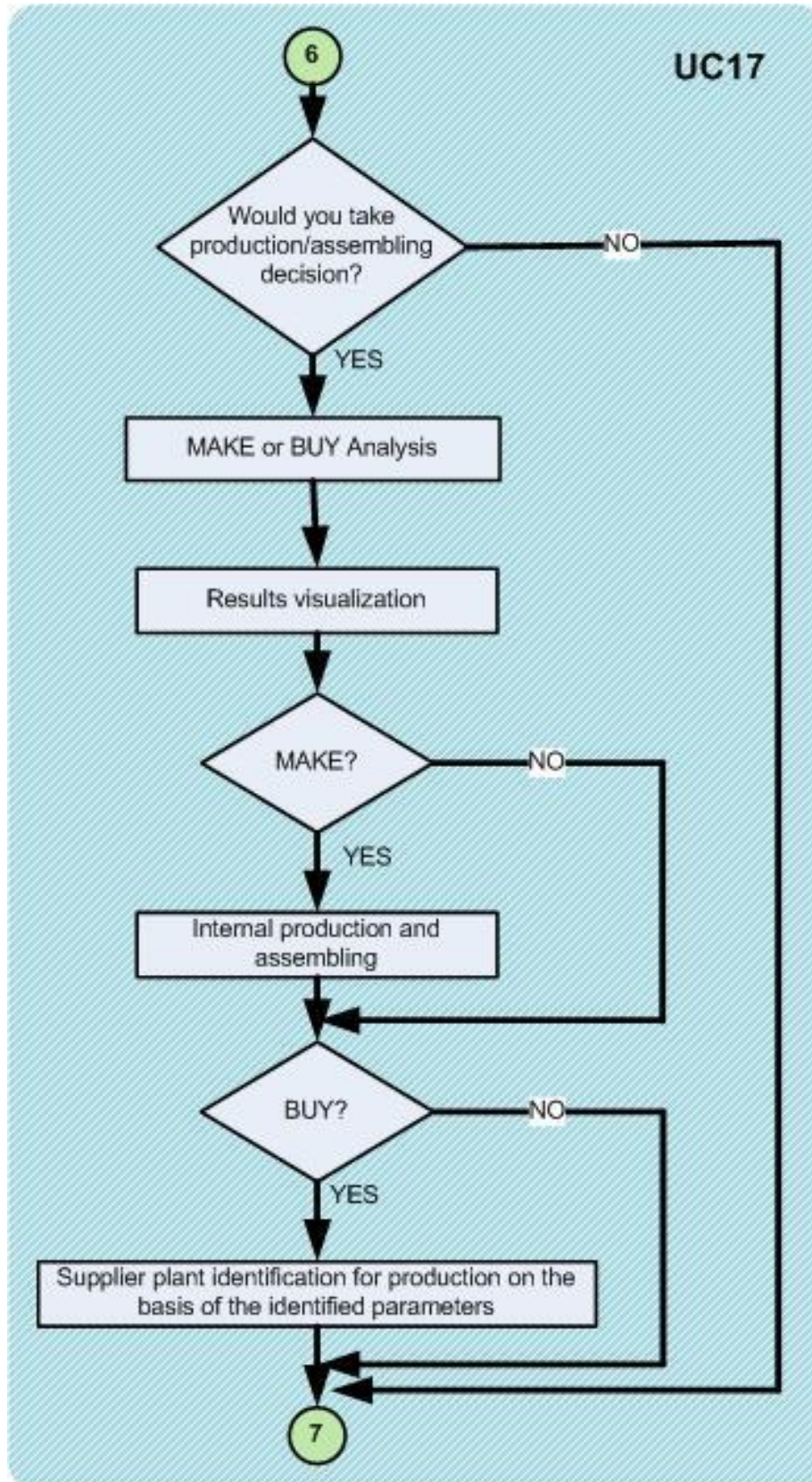


Figure 26: Flow of OEM tasks (manufacturing phase)(5/6)

4.3.18 Use Case UC18: Supply chain configuration

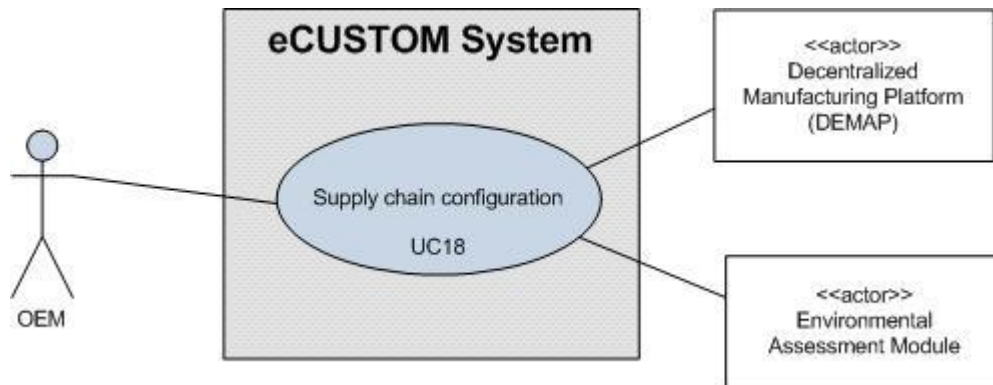


Figure 27: Supply chain configuration Use Case Diagram

Use Case ID	UC18
Use Case Name	Supply chain configuration
Goal/Purpose:	Generate the order and the required data to start an internal assembling process
Actors	Main actors: OEM
Preconditions and Postconditions	
Main Success Scenario (or Basic Flow):	<p>The developed method should support OEM in supply chain optimization, in order to identify the plants (supplier or internal ones) in charge to produce / assemble the different components and, eventually, the dealer in charge to assemble them.</p> <p>In function of different input data (productive capacity, productive costs, transportation costs, market demands, markets localization, etc.), a supply chain configuration is provided in terms of:</p> <ul style="list-style-type: none"> • identification of supplier and/ or internal plants • allocation of productive quantities for each identified plant

Table 21: Use Case 18 Description

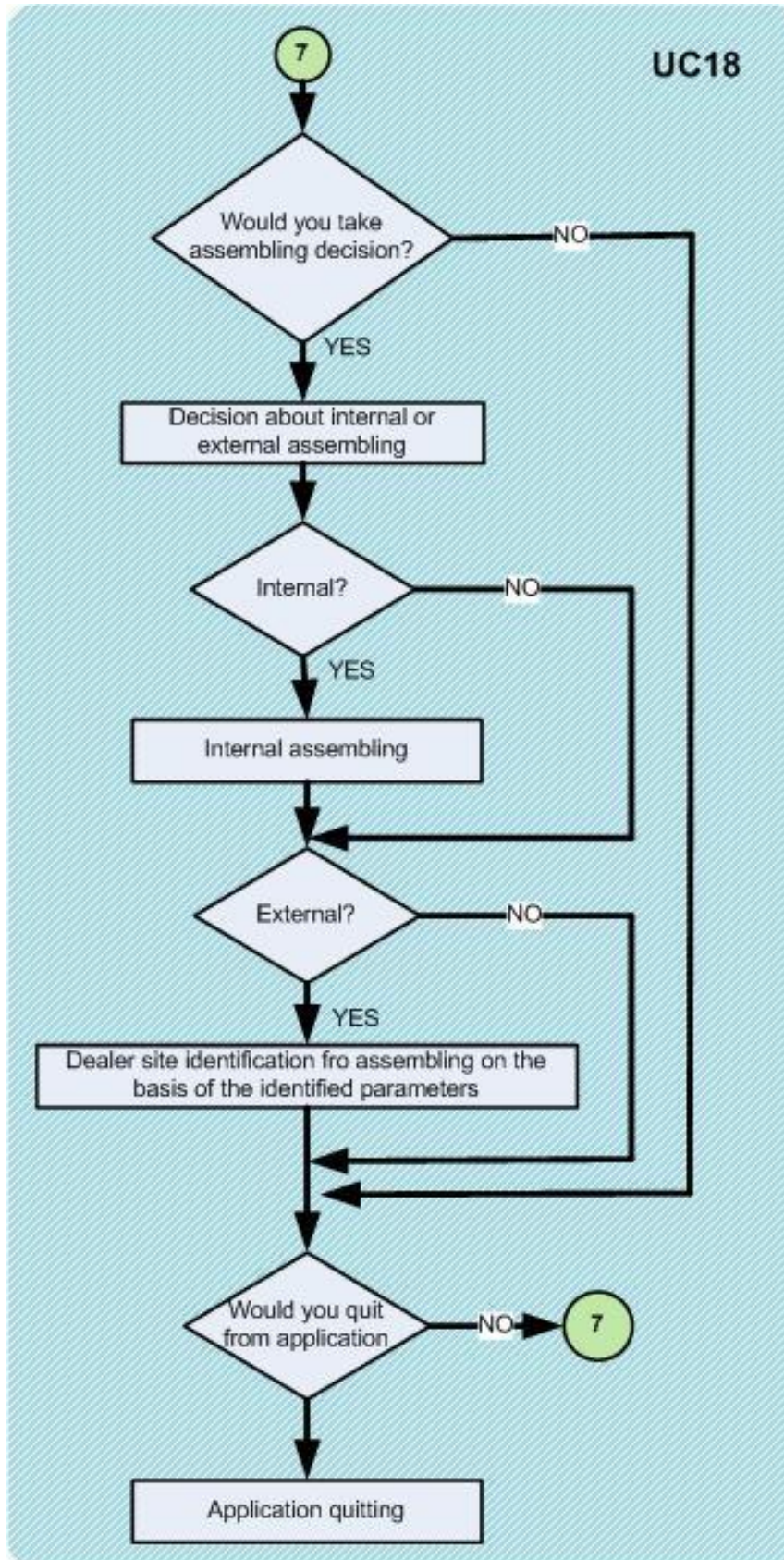


Figure 28: Flow of the OEM tasks (manufacturing phase) (6/6)

4.4 Step 3 – Mapping operational requirements on processes and activities with the defined pylons:

Second column of the following table defines in which Pylon each Use Case is situated. Since Pylon IV supports coverage for the whole data exchange infrastructure it is considered to affect all Use Cases.

Use Case	Pylon	As-is	To-Be
UC1: Access to website	Pylon I	Standard web interface available from W3C browsers	Same as in the "as is" case
	Pylon IV	IIS/ asp.NET Collaboration Portal (CP) installation based on ice.NET framework	
Use Case UC2: Register to website	Pylon I	Currently no registration is required	Customer will register so that his order can be tracked, retrieved and edited if required
	Pylon IV	Ice.NET/ CP User management	
Use Case UC3: Login to website	Pylon I	Customer logs on to website, no login required	Customer will provide login data so that feedback can be provided to him in the form of email/sms or other notification
	Pylon IV	Ice.NET User authentication	
Use Case UC4: Car Style choice	Pylon I	Not available today	The system visualizes a certain number of style alternatives and, for each alternative, some different images. The user expresses his preference among the different proposed alternatives
	Pylon IV	Document management	Product structure
Use Case UC5: View car style history	Pylon I	Not available today	The e-CUSTOM system allows the user to see the results of previous steps of car style session.
	Pylon IV		Master/Revision Management for product data

Use Case	Pylon	As-is	To-Be
Use Case UC6: Write comments	Pylon I	Dedicated windows for destructured comments	Structured answers, multiple choice, yes/no buttons and text forms will be available for the user to express his comments.
	Pylon IV	CP document management	Document management
Use Case UC7: Update information	Pylon I	Not available today	OEM can add info (image, video, text or other relevant data) for a new car style or accessory or update existing. This is stored in the database so that it becomes available to all customers using the e-CUSTOM system.
	Pylon III	Not available today	OEM can add environmental information. This is stored in the database so that it becomes available to all customers using the e-CUSTOM system.
	Pylon IV	Document management	Revision Management
Use Case UC8: Accessory Design	Pylon I	Not available today. Customers only select options	In the accessory design the user should have the ability to intervene on the accessory either by adding/removing features, or if possible altering its design in a constrained way (e.g. adding text to be printed) with use of VR / AR system capabilities
	Pylon III	Not available today	The user visualizes environmental information associated to accessory' options
	Pylon IV	CP document management for drawings/sketches	PDM document assignement Product data management

Use Case	Pylon	As-is	To-Be
Use Case UC9: Receive end users feedback	Pylon I	Destructured method for feedback analysis	Users' feedbacks collected are stored at OEM databases and should be accessible by the OEM role within the UADS. A list of all designs should be available for the OEM. In the case of multiple choice questions, graphs should be available to assist the visualization of the feedback.
	Pylon IV		<ul style="list-style-type: none"> • Ratings • Strong relation to accessory documents
Use Case UC10: Receive sketches	Pylon I	Only for limited applications	The system is able to accept new sketches, store them in a database and link them to the user session
	Pylon IV		Master/Revision Management of product data
Use Case UC11: Receive comments	Pylon I	Only for limited applications	The system is able to accept user comments, store them in a database and link them to the user session
	Pylon IV		Custom attributes
Use Case UC12: Creation of new alternatives	Pylon I	Not available today	OEM uploads new versions/ styles of the car so that it is visible to the customers. UADS will allow uploading all relevant data to define / structure a new alternative
	Pylon IV		Versioning/History support by master/revision management
Use Case UC13: Send ideas	Pylon I	Not available today	Simple form asking the user what kind of feedback he would like to send. Depending on his choice UC
	Pylon IV	CP document management	E-mail notification

Use Case	Pylon	As-is	To-Be
Use Case UC14: Write categorized comments	Pylon I	Only for limited applications	The user can write categorized comments (i.e.: materials, accessories, colours, etc.) that are stored and linked to his session and are visible to the OEM.
	Pylon IV		Custom attributes
Use Case UC15: Insert sketch	Pylon I	Only for limited applications	The user can attach sketches that are linked to his session and are visible to the OEM. Three functions might be implemented: <ul style="list-style-type: none"> - Free sketching tools - Alteration of existing sketches by using slide bars etc., including VR / AR capabilities Upload of files (pdf, jpg etc.)
	Pylon IV		Master/Revision Management PDM structure
Use Case UC16: Update manufacturing information and elaborate environmental data	Pylon II	Managed by excel sheets	Each OEM, supplier dealer should log in to the system under his role and upload data regarding his location, the products he can provide and so forth. The database with this information will need to be accessible by DEMAP so that manufacturing/ supply schemes can be derived.
	Pylon III	Reference example FIAT, the environmental consideration is a part of FIAT policy	For each alternative option associated to the different accessories within e-CUSTOM, the system estimates an environmental impact index based on evaluation of the following parameters: <ul style="list-style-type: none"> ▪ Material ▪ Transportation (kilometrical distance and means of

Use Case	Pylon	As-is	To-Be
			<p>transport)</p> <ul style="list-style-type: none"> ▪ Localization (national energetic mix tables) <p>The system stores the data for the environmental evaluation indexes. The decision will be based on the consideration of environmental impact and other factors</p>
	Pylon IV	CP organisation management	Custom information for organisations/User and Roles
UC17: Take production / assembling decision	Pylon II	Managed by excel sheets	<p>The system should have the functionality to identify the best production / assembling solution for the accessory:</p> <ul style="list-style-type: none"> • make (the OEM decides to produce / assemble the accessory internally) • buy (the OEM decides to outsource the production / assembly of the accessory). <p>The system should provide an investment analysis with the evaluation of economical indexes (i.e.: Net Present Value, Internal Rate of Return). The selection of the best productive and assembling solution is based on:</p> <ul style="list-style-type: none"> • production cost • transportation cost (evaluated also on the basis of Kilometrical distances to be covered) • requested volumes • environmental impact <p>The developed method suggest to OEM the best productive and assembling solution/ solutions.</p> <p>The information related to investment analysis must be collected and stored.</p>

Use Case	Pylon	As-is	To-Be
	Pylon III	Is done through specific software.	The information about dealers as well as suppliers regarding environmental information i.e. Kilometrical distances between OEMs, suppliers and dealer will be stored in the database to be used for retrieval purposes when needed
	Pylon IV	Ice.NET Lifecycle management	Custom design decision lifecycle
Use Case UC18: Supply chain configuration	Pylon II	Managed by excel sheets	<p>The developed method should support OEM in supply chain optimization, in order to identify the plants (supplier or internal ones) in charge to produce / assemble the different components and, eventually, the dealer in charge to assemble them.</p> <p>In function of different input data (productive capacity, productive costs, transportation costs, market demands, markets localization, etc.), a supply chain configuration is provided in terms of:</p> <ul style="list-style-type: none"> Identification of supplier and/ or internal plants Allocation of productive quantities for each identified plant.
	Pylon III	Not available (no application for make or buy decision)	OEM decision is based also on environmental considerations.
	Pylon IV		

Table 22: Mapping operational requirements on processes and activities with the defined pylons

4.5 Step 4 – Definition of the implementation strategy

By examining the existing situation and comparing it with that envisioned in the use case, it is possible to highlight those activities that are already performed in common industrial contexts, those that are already performed but need to be adapted to fit the e-CUSTOM solution, and those that have to be developed from scratch.

Use Case	Pylon	To-Be	Implementation category	Technological aspects (if necessary)
UC1: Access to website	Pylon I	Same as in the “as is” case	<input checked="" type="checkbox"/> No changes needed <input type="checkbox"/> Modifications required <input type="checkbox"/> New implementation	
	Pylon IV	Same as in the “as is” case		
Use Case UC2: Register to website	Pylon I	Customer will register so that his order can be tracked, retrieved and edited if required	<input type="checkbox"/> No changes needed <input type="checkbox"/> Modifications required <input checked="" type="checkbox"/> New implementation	New UI component to gather user identification and contact data and register the user in the database. Self-service registration page Captcha recognition
	Pylon IV			
Use Case UC3: Login to website	Pylon I	Customer will provide login data so that feedback can be provided to him in the form of email/sms or other notification	<input checked="" type="checkbox"/> No changes needed <input type="checkbox"/> Modifications required <input type="checkbox"/> New implementation	
	Pylon IV			
Use Case UC4: Car Style choice	Pylon I	The system visualizes a certain number of style alternatives and, for each alternative, some different images. The user expresses his preference among the different proposed alternatives	<input type="checkbox"/> No changes needed <input checked="" type="checkbox"/> Modifications required <input type="checkbox"/> New implementation	Based on CAD structures, simulation structures more generalized product data structures have to be developed
	Pylon IV	Product structure		
Use Case UC5: View car style history	Pylon I	The e-CUSTOM system allows the user to see the results of previous steps of car style session.	<input type="checkbox"/> No changes needed <input type="checkbox"/> Modifications required <input checked="" type="checkbox"/> New implementation	The product data model has to be extended about master/revision objects and classes.
	Pylon IV	Master/Revision Management for product data		

Use Case	Pylon	To-Be	Implementation category	Technological aspects (if necessary)
Use Case UC6: Write comments	Pylon I	Structured answers, multiple choice, yes/no buttons and text forms will be available for the user to express his comments.	<input type="checkbox"/> No changes needed <input type="checkbox"/> Modifications required <input checked="" type="checkbox"/> New implementation	The document management needs to be integrated in the product structure. Relations between part and documents have to be described.
	Pylon IV	Document management		
Use Case UC7: Update information	Pylon I	OEM can add info (image, video, text or other relevant data) for a new car style or accessory or update existing. This is stored in the database so that it becomes available to all customers using the e-CUSTOM system.	<input type="checkbox"/> No changes needed <input checked="" type="checkbox"/> Modifications required <input type="checkbox"/> New implementation	Existing models and code with regard to the product structure model and the Master/Revision model can be modified for a proper revision management
	Pylon III	OEM can add environmental information. This is stored in the database so that it becomes available to all customers using the e-CUSTOM system		
	Pylon IV	Revision Management		
Use Case UC8: Accessory Design	Pylon I	In the accessory design the user should have the ability to intervene on the accessory either by adding/removing features, or if possible altering its design in a constrained way (e.g. adding text to be printed) with use of VR / AR system capabilities	<input type="checkbox"/> No changes needed <input type="checkbox"/> Modifications required <input checked="" type="checkbox"/> New implementation	To the product data model new object types have to be developed in order to enable user-oriented content in the system

Use Case	Pylon	To-Be	Implementation category	Technological aspects (if necessary)
	Pylon III	The user visualizes environmental information associated to accessory' options		
	Pylon IV	PDM document assignment Product data management		
Use Case UC9: Receive end users feedback	Pylon I	Users' feedbacks collected are stored at OEM databases and should be accessible by the OEM role within the UADS. A list of all designs should be available for the OEM. In the case of multiple choice questions, graphs should be available to assist the visualization of the feedback.	<input type="checkbox"/> No changes needed <input type="checkbox"/> Modifications required <input checked="" type="checkbox"/> New implementation	Web 2.0 technologies, such as rating systems and comments have to be embedded in the implementation.
	Pylon IV	<ul style="list-style-type: none"> • Ratings • Strong relation to accessory documents 		
Use Case UC10: Receive sketches	Pylon I	The system is able to accept new sketches, store them in a database and link them to the user session	<input type="checkbox"/> No changes needed <input type="checkbox"/> Modifications required <input checked="" type="checkbox"/> New implementation	The product data model has to be extended about master/revision objects and classes.
	Pylon IV	Master/Revision Management of product data		
Use Case UC11: Receive comments	Pylon I	The system is able to accept user comments, store them in a database and link them to the user session	<input type="checkbox"/> No changes needed <input checked="" type="checkbox"/> Modifications required <input type="checkbox"/> New implementation	The developed product data model can be used and extended by custom attributes within the object types to extend the functionalities.
	Pylon IV	Custom attributes		

Use Case	Pylon	To-Be	Implementation category	Technological aspects (if necessary)
Use Case UC12: Creation of new alternatives	Pylon I	OEM uploads new versions/ styles of the car so that it is visible to the customers. UADS will allow uploading all relevant data to define / structure a new alternative	<input type="checkbox"/> No changes needed <input type="checkbox"/> Modifications required <input checked="" type="checkbox"/> New implementation	Adding to the Master (Revision data model further object types with regard to data history management.
	Pylon IV	Versioning/History support by master/revision management		
Use Case UC13: Send ideas	Pylon I	Simple form asking the user what kind of feedback he would like to send. Depending on his choice UC	<input type="checkbox"/> No changes needed <input checked="" type="checkbox"/> Modifications required <input type="checkbox"/> New implementation	Modification of existing notification technologies to support mail protocols
	Pylon IV	E-mail notification		
Use Case UC14: Write categorized comments	Pylon I	The user can write categorized comments (i.e.: materials, accessories, colours, etc.) that are stored and linked to his session and are visible to the OEM.	<input type="checkbox"/> No changes needed <input type="checkbox"/> Modifications required <input checked="" type="checkbox"/> New implementation	The developed product data model can used and extended by custom attributes within the object types to extend the functionalities
	Pylon IV	Custom attributes		
Use Case UC15: Insert sketch	Pylon I	<p>The user can attach sketches that are linked to his session and are visible to the OEM. Three functions might be implemented:</p> <ul style="list-style-type: none"> - Free sketching tools - Alteration of existing sketches by using slide bars etc., including VR / AR capabilities - Upload of files (pdf, jpg etc.) 	<input type="checkbox"/> No changes needed <input type="checkbox"/> Modifications required <input checked="" type="checkbox"/> New implementation	The product data model has to be extended about master/revision objects and classes.
	Pylon IV	Master/Revision Management PDM structure		

Use Case	Pylon	To-Be	Implementation category	Technological aspects (if necessary)
<p>Use Case UC16: Update manufacturing information and elaborate environmental data)</p>	<p>Pylon II</p>	<p>Each OEM, supplier dealer should log in to the system under his role and upload data regarding his location, the products he can provide and so forth.</p> <p>The database with this information will need to be accessible by DEMAP so that manufacturing/ supply schemes can be derived.</p>	<p> <input type="checkbox"/> No changes needed <input checked="" type="checkbox"/> Modifications required <input type="checkbox"/> New implementation </p>	<p>The existing user management module has to adapted in order to store enhanced properties such as organisational information, roles etc.</p>
	<p>Pylon III</p>	<p>For each alternative option associated to the different accessories within e-CUSTOM, the system estimates an environmental impact index based on evaluation of the following parameters:</p> <ul style="list-style-type: none"> ▪ Material ▪ Transportation (kilometrical distance and means of transport) ▪ Localization (national energetic mix tables) <p>The system stores the data for the environmental evaluation indexes. The decision will be based on the consideration of environmental impact and other factors</p>		
	<p>Pylon IV</p>	<p>Custom information for organisations/User and Roles</p>		

Use Case	Pylon	To-Be	Implementation category	Technological aspects (if necessary)
<p>UC17: Take production / assembling decision</p>	<p>Pylon II</p>	<p>The system should have the functionality to identify the best production / assembling solution for the accessory:</p> <ul style="list-style-type: none"> • make (the OEM decides to produce / assemble the accessory internally) • buy (the OEM decides to outsource the production / assembly of the accessory). <p>The system should provide an investment analysis with the evaluation of economical indexes (i.e.: Net Present Value, Internal Rate of Return).</p> <p>The selection of the best productive and assembling solution is based on:</p> <ul style="list-style-type: none"> • production cost • transportation cost (evaluated also on the basis of Kilometrical distances to be covered) • requested volumes • environmental impact <p>The developed method suggest to OEM the best productive and assembling solution/ solutions.</p> <p>The information related to investment analysis must be collected and stored.</p>	<p><input type="checkbox"/> No changes needed <input checked="" type="checkbox"/> Modifications required <input type="checkbox"/> New implementation</p>	<p>A lifecycle module has to be adapted to the needs of the e-CUSTOM scenarios.</p>
	<p>Pylon III</p>	<p>The information about dealers as well as suppliers regarding environmental information i.e. Kilometrical distances between OEMs, suppliers and dealer will be stored in the database to be used for retrieval purposes when needed</p>		
	<p>Pylon IV</p>	<p>Custom design decision lifecycle</p>		

Use Case	Pylon	To-Be	Implementation category	Technological aspects (if necessary)
Use Case UC18: Supply chain configuration	Pylon II	<p>The developed method should support OEM in supply chain optimization, in order to identify the plants (supplier or internal ones) in charge to produce / assemble the different components and, eventually, the dealer in charge to assemble them.</p> <p>In function of different input data (productive capacity, productive costs, transportation costs, market demands, markets localization, etc.), a supply chain configuration is provided in terms of:</p> <p>identification of supplier and/ or internal plants allocation of productive quantities for each identified plant.</p>	<input type="checkbox"/> No changes needed <input checked="" type="checkbox"/> Modifications required <input type="checkbox"/> New implementation	<p>The developed product data model has to be extended by custom attributes. A relation to UC16 to the enhanced properties vault has to be considered.</p>
	Pylon III			
	Pylon IV	OEM decision can be based also on environmental considerations		

Table 23: Implementation Strategy

4.6 Step 5 – Identification of verification and acceptance criteria

This section presents the defined criteria in order to verify the functionality of the envisioned solution.

Criteria	Acceptance criteria designation	Objective
1	Number of end-users registered on the website	>1000
2	How many options chosen by the end-user are considered by OEM? = number of options considered by OEM / number of option chosen by end-user	>80%
3	Number of end-users sending feedback / number of end-users registered on website	>80%
4	Number of end-users sending sketches / number of end-users registered on website	>30%
5	Number of end-users choosing low environmental impact accessories / number of end-users choosing accessories	>50%
6	Time between expiration date of one style session and the starting date of the next one	<2 months
7	Reduction of supply chain cost	-5%
8	Reduction of environmental impact for transportation	-5%

Table 24: Acceptance Criteria

Remarks:

_ n°5: e-Custom system needs to show the environmental impact associated to each option (perhaps just a qualitative value: low, medium, high)

_ n°6: The proposed criteria wants to evaluate the time spent by the OEM to elaborate the feedbacks, and to develop new alternative, rather than to contact the users for the second time, what avoids spending also time.

_ n°7: This criteria is related to DEMAP output. In their test case, we can imagine that a mathematical model could provide them a cost of supply chain scenario. The inputs and outputs of this optimization algorithm will be defined in WP3. This cost will be available in automatic way on the e-Custom system.

Reduction of raw materials cost can be included as a part of the optimization of the supply chain cost. Maybe the optimization algorithm to be proposed can also include raw material supply and management. This could also be linked with the DEMAP approach.

Regarding software

Criteria	Acceptance criteria designation	Objective
1	send a survey of customer satisfaction to all end-users (ergonomics, efficiency, fluidity of interface)	To obtain a global note >7/10

Table 25: Acceptance Criteria regarding software

5 PILOT CASE 2: MEDICAL AND HEALTHCARE; THE CASE OF ORTHOTIC INSOLES

5.1 Information coming from D1.1

D1.1 delivers data sets from the customer such as requirements/requests and visualisation data. The following table summarizes the information coming from D1.1.

	User requirements	Owner
Pylon I	Consultation with practitioner	Patient
	Physical interaction with scanning of the feet	Patient & Practitioner
	Patient contact details	Patient & Practitioner
	Discussion of any previously stored diagnosis	Patient & Practitioner
	Selection of type of footwear	Patient & Practitioner
	Further consultation to come to an agreed symptoms	Patient & Practitioner
	Analysis of the scan and correction of the alignment	Practitioner
	Prescription and choice of top cover	Patient
	Possible cost estimate and delivery date	Practitioner
	Online tracking updates of order	Patient
	Online tracking updates and discussing with production centre any issues	Practitioner
	Approval of order	Production centre manger
CAD Design and Manufacture	Production centre designer and manufacturer	
Pylon II	Identify best production/assembly solution	e-CUSTOM & Practitioner
	Load information about Production facilities/Supplier/Dealer	Practitioner
Pylon III	Evaluation of environmental impact	e-CUSTOM
Pylon IV	Secure transmission of personal information and data	e-CUSTOM
	Online tracking of the status	End User

Table 26: User requirements

Coming from the analysis of the scenarios performed in the D1.1 there are also the descriptions of current procedures of patient consultation, practitioner activities and laboratory manufacturing. The following activity diagrams present the mentioned procedures.

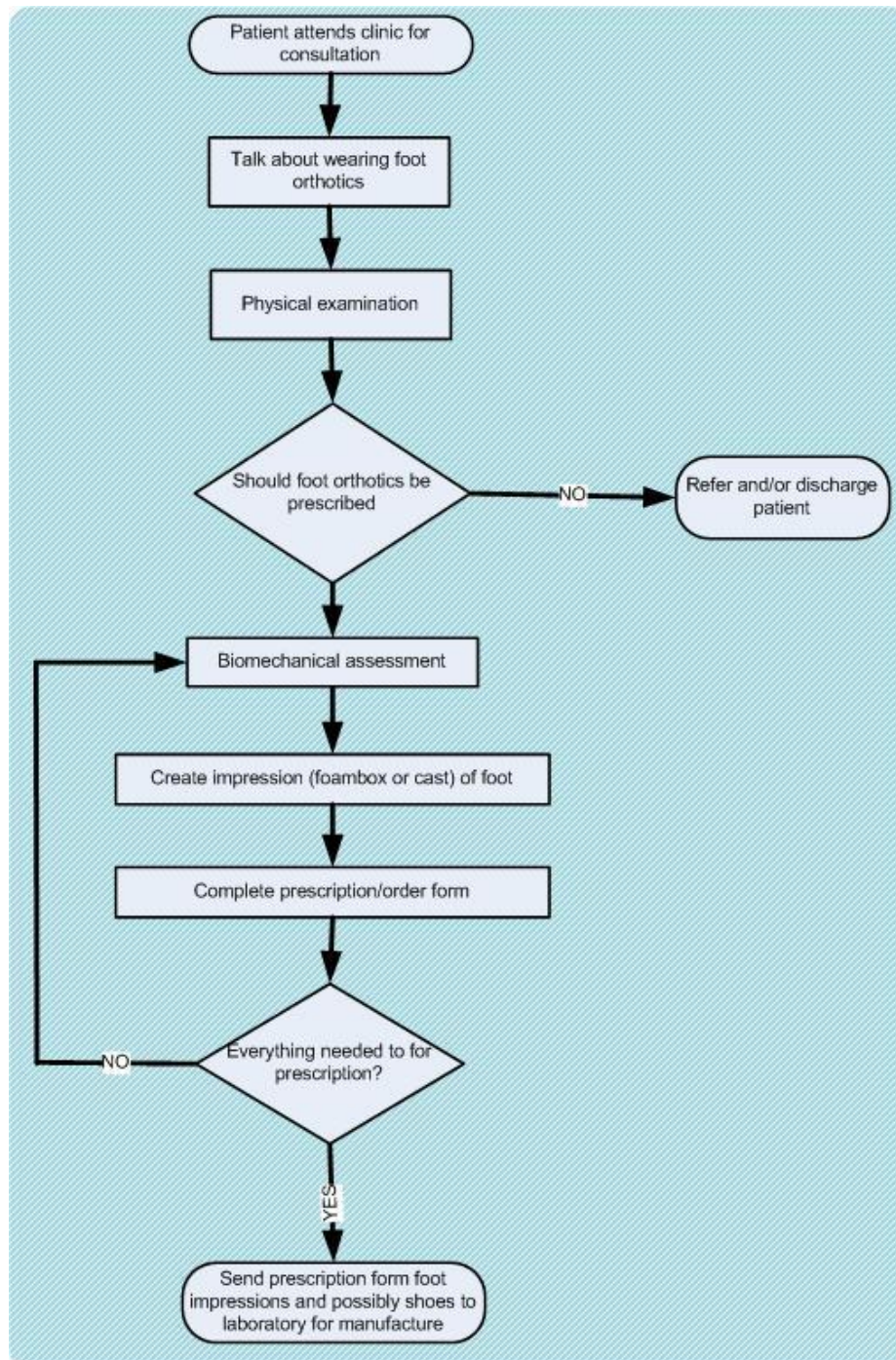


Figure 29: Practitioner workflow before manufacture

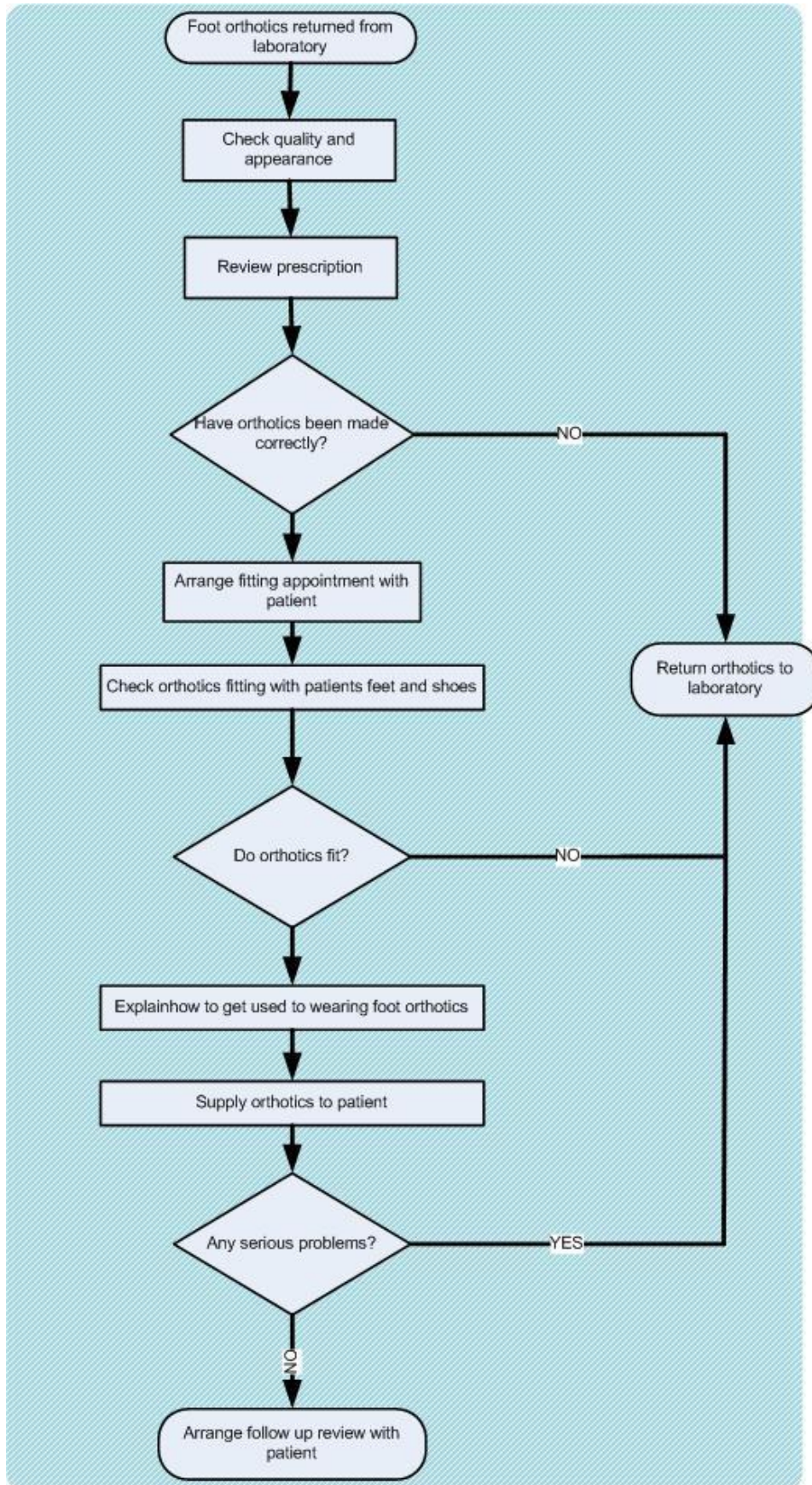


Figure 30: Practitioner workflow after manufacture

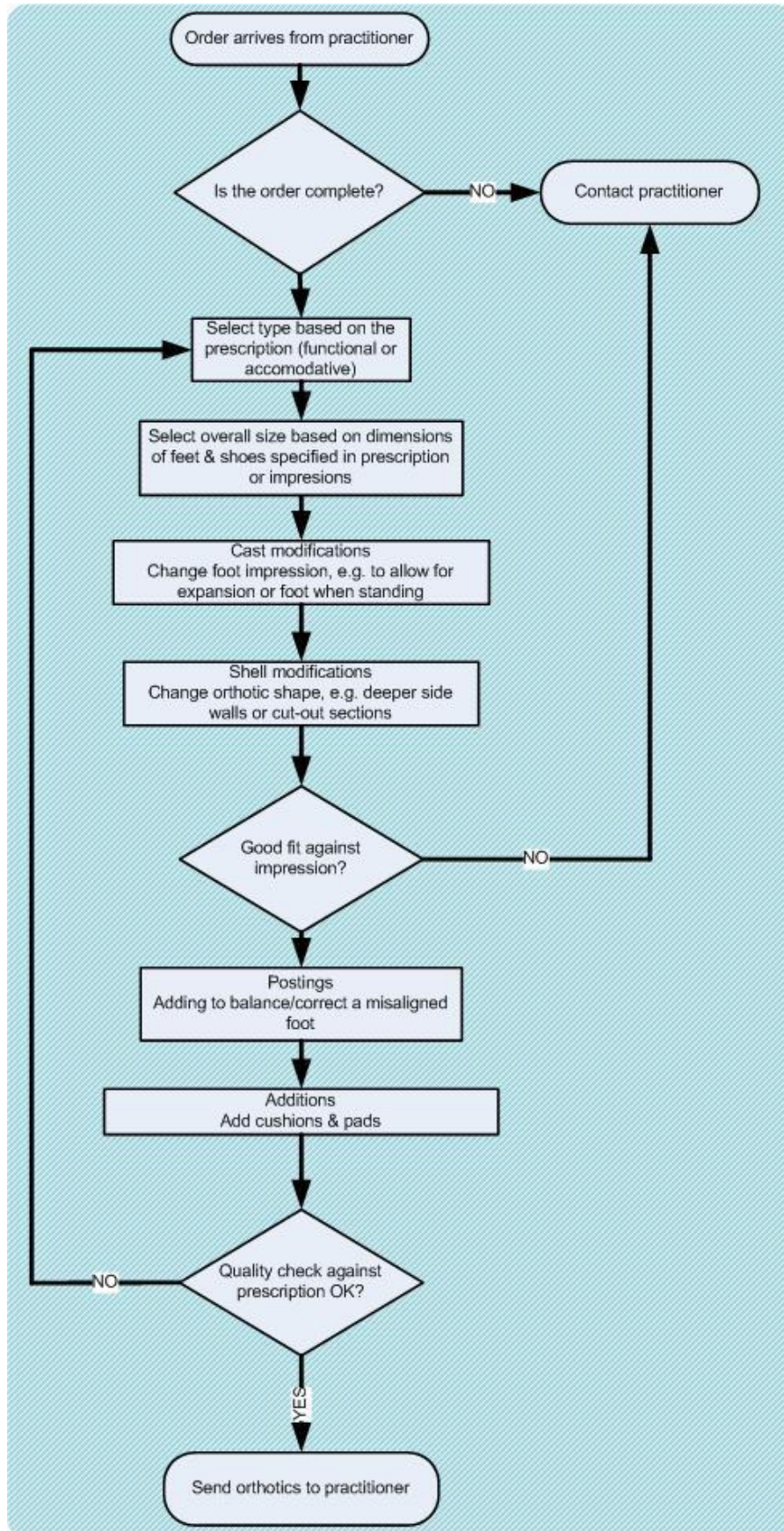


Figure 31: Laboratory workflow

5.2 Step 1 – Identification of ‘use cases’ and actors involved with pilot case

After an exhaustive analysis of user requirements and specifications documented in D.1.1 performed by analyst and industrial partners, the following actors and use cases have been identified to provide a complete description of the automotive pilot case required functionality.

5.2.1 Users/Actors Identification

For fully customised prescription orthotic devices, which will involve a qualified professional (practitioner) to examine the patient to create a prescription, the following users are identified together with a brief description of their responsibilities and level of experience:

- *Patient* – the person for whom the orthotic device is being designed. We can assume no specialist technical (software) or medical knowledge. It is possible, although not assumed, that they will have access to the internet.
- *Practitioner* – the person who is prescribing the orthotic based on an examination. They are in direct contact with the patient during the initial examination which collects patient data (e.g. impressions of the patient’s feet, details of the complaint & details of any corrective actions) and in a fitting consultation after manufacture. They have medical knowledge to prescribe the orthotic but limited technical (software) awareness. Typically based in a clinic which we assume has internet access.
- *Designer* – the person who makes the orthotic based on the data supplied by the practitioner. They possibly have some medical knowledge through experience in the industry. If their current design process is digital (CAD/CAM based) then they are likely to have a reasonable technical (software) awareness. If their current process is non-digital then, again, this will be limited. Typically based in a laboratory with internet access.
- *Manufacturer* – the person who takes the orthotics design and creates the finished device. This may involve use of CAM (milling or routing machines) to manufacture the CAD designs and any additional finishing steps (smoothing, cleaning and fitting pads and top covers). Typically based in a laboratory and supplying manufactured orthotics to a number of practitioners, it is quite possible that the manufacturer and designer is in fact the same person in the same location. We assume that they also have internet access.

5.2.2 Use Case UC1: Collect patient personal data

The patient walks into the practitioner’s surgery for the first time, and together with the practitioner they use a web interface in a dedicated integrated PC (OrthoPOD) to collect his/her personal data and contact details. It is required to fill in a registration form, providing some personal information: Name, Surname, Female/Man, Country, Age, Occupation and E-mail. After the registration, the system provides to the patient a login and a password (could be provided by e-mail) that will be used if the user would like to access the web application again in the future (for example to track an order). The e-CUSTOM system stores user registration data. After the personal data collection the next action will be to collect patient foot data (UC2).

5.2.3 Use Case UC2: Collect patient foot data

The e-CUSTOM system asks for the patient to step on to the scanner of the OrthoPOD and each foot is scanned. After that scanning process the practitioner and client is presented with

a web interface to put in details of the problems that they are suffering from and for the selection of shoe types. The practitioner initially offers technical advice and consultation, and when successful the patient on his/her own can introduce more non-technical data (UC3).

5.2.4 Use Case UC3: Select non-medical options

The e-CUSTOM system offers an interface for cosmetic customization of the appearance and texture of orthotics with visualization possibilities. The patient can select between the following cosmetic options: colors, engraving, top-cover materials and delivery time. The patient selects his/her preferences and saves them (UC4)

5.2.5 Use Case UC4: Save user preferences

The patient stores his/her preferences and the e-CUSTOM system univocally associate selected preferences to the specific patient.

5.2.6 Use Case UC5: Receive update on the order

The users are notified automatically when a significant event occurs (e.g. The order has been received from laboratory).

5.2.7 Use Case UC6: Track order

The patient logs into the website from a remote location and can check the current status of the order into the web browser

5.2.8 Use Case UC7: Insert information about practitioner

e-CUSTOM system provides an interface to upload information about the practitioner such as name and location

5.2.9 Use Case UC8: View status of orders

The practitioner logs in to the website and can check the current status of the order into the web browser with more detail.

5.2.10 Use Case UC9: Collect patient prescription

The practitioner elaborates the prescription for the orthotics including the following options for the general orthotic definition:

- Type – e.g. men's sports, woman's dress
- Material – e.g. polypropylene, EVA
- Length – e.g. full foot, $\frac{3}{4}$ length

5.2.11 Use Case UC10: Transfer data for design

e-CUSTOM system shows the available designers and their associated environmental indexes. The practitioner selects a designer. The practitioner sends all data digitally collected to the Design laboratory as an order.

5.2.12 Use Case UC11: Visualise and Analyse patient foot data

The practitioner is able to use the system to highlight problem areas to the patient. The patient is able to view the collected data, the foot scan particularly, and an analysis is being done by the practitioner in initial consultation.

e-CUSTOM System visualizes the scanned data. The practitioner verifies the data and highlights problem areas. e-CUSTOM system provides tools to analyse the foot data which aid the consultation process. This may include alignment of the scan, size measurement from identified points on the scan (heel centre, heel bisector, metatarsals), measurements or colour-maps showing deviation of the scan from “normal”.

e-CUSTOM system allows the designer to visualize the foot scan data. Designer determines if the data is acceptable to use as the basis for the design (UC16) e-CUSTOM system provides analysis tools for designers to aid the designing process.

5.2.13 Use Case UC12: View prescription data

e-CUSTOM system allows the designer to get the required data from the prescription.

5.2.14 Use Case UC13: Insert information about designer

e-CUSTOM system provides an interface to upload information about the designer such as name and location

5.2.15 Use Case UC14: Send to manufacturer

e-CUSTOM system shows the available manufacturers and their associated environmental indexes. The designer selects a manufacturer. The designer sends all data digitally collected to the Manufacturing laboratory as an order.

5.2.16 Use Case UC15: Orthotic design

The practitioner participates in the design adding some elements in direct consultation with the patient: type of shoe into which the orthotic is fitted, top covers materials and design (pattern), personalized engravings. Based on the practitioner’s input (e.g. orthotic type, prescription & scan data), e-CUSTOM provides tools to create the final orthotic design for manufacture. Tools to modify the orthotic are: 1) non-corrective modifications, for example: soft tissue expansion, arch raising or lowering, and 2) corrective modifications, for example: postings (intrinsic & extrinsic), shell specification (skives, flanges, heel cups, grooves and cut-outs), additions (cushions, pads and extensions). The manufacturer arranges one or more designs (from one or more orders) within a block of material for manufacture by milling or routing. The manufacturer adds manufacturing specific design. e-CUSTOM system provides tools to all details to the design to allow manufacturing (e.g. pins to stabilise the product as it is being milled)

5.2.17 Use Case UC16: Approve or reject the order

The designer checks the quality of data received from the practitioner order. The designer approves or rejects the order. e-CUSTOM system changes the status of the order.

The manufacturer checks the suitability of data received from the designer order for manufacturing process. The manufacturer approves or rejects the order. e-CUSTOM system changes the status of the order.

5.2.18 Use Case UC17: Insert information about manufacturer

e-CUSTOM system provides an interface to upload information about the manufacturer such as name and location

5.2.19 Use Case UC18: Generate and send data for manufacture

The manufacturer generates specific data for manufacture depending on the manufacturing process required. Additive manufacturing would have different requirements (e.g. a closed STL (triangle) model) on the design compared to milling (e.g. toolpaths to drive the milling machine). The manufacturer sends data to manufacturing machine (miller, router, additive manufacture) to create the orthotic device

5.3 Step 2 - Formalization of operational processes with modelling tools

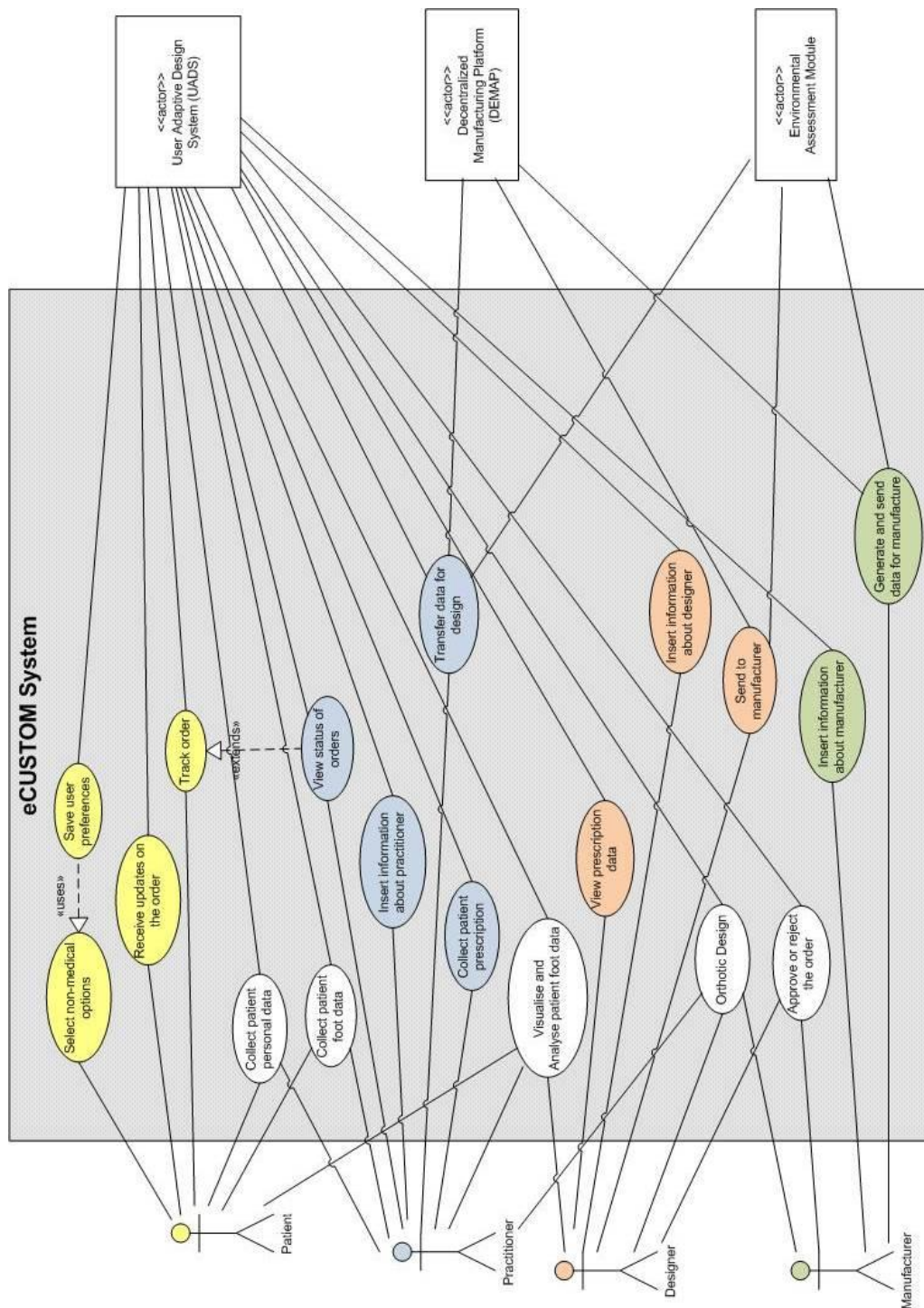


Figure 32: Healthcare Case -Use Cases Diagram

5.3.1 Use Case UC1: Collect patient personal data

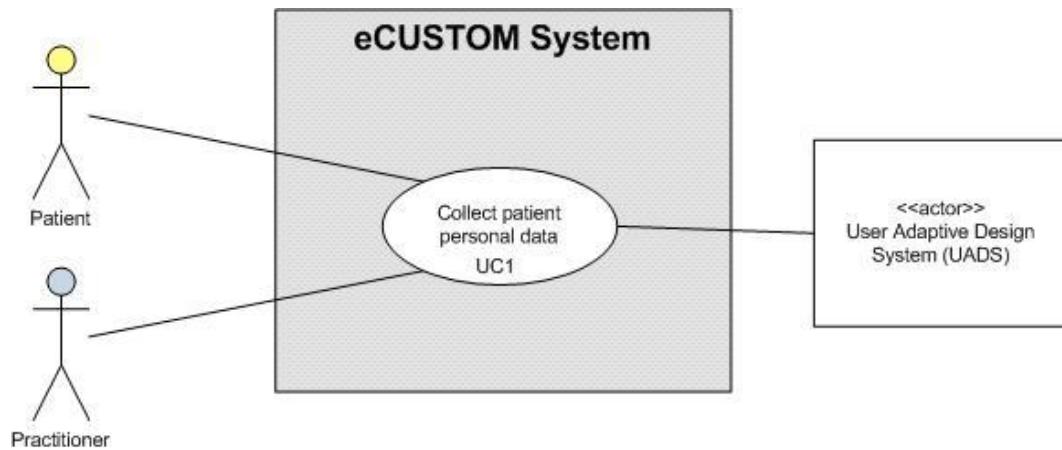


Figure 33: Collect patient personal data Use Case Diagram

Use Case ID	UC1
Use Case Name	Collect patient personal data
Goal/Purpose:	Register patient contact details and create his/her profile in the e-CUSTOM system
Actors	Main actors: Patient, Practitioner Secondary actors: UADS
Preconditions and Postconditions	
Main Success Scenario (or Basic Flow):	<ol style="list-style-type: none"> 1. The patient and the practitioner access the e-CUSTOM OrthoPOD platform (dedicated PC and scanner) 2. e-CUSTOM system asks the patient to introduce his/her contact details.(Name, Surname, Female/Man, Country, Age, Occupation, E-mail,) 3. e-CUSTOM system provides to the patient a login and a password 4. e-CUSTOM system stores user registration data.

Table 27: Use Case 1 Description

5.3.2 Use Case UC2: Collect patient foot data

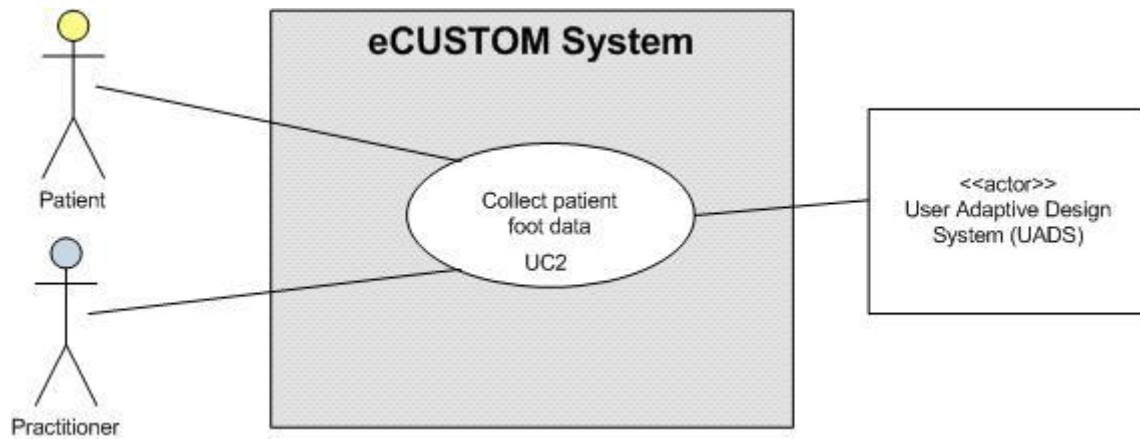


Figure 34: Collect patient foot data Use Case Diagram

Use Case ID	UC2
Use Case Name	Collect patient foot data
Goal/Purpose:	Scan an image of the patient's foot and collect general information about the problem
Actors	Main actors: Patient, Practitioner Secondary actors: UADS
Preconditions and Postconditions	To start this Use Case the patient is required to be registered. This Use Case is finished when the patient doesn't need the practitioner's support
Main Success Scenario (or Basic Flow):	<ol style="list-style-type: none"> 1. The e-CUSTOM system asks for the patient to step on to the scanner of the OrthoPOD 2. OrthoPOD scans each foot 3. e-CUSTOM system presents a web interface to introduce more details about the problem 4. Patient and practitioner introduce technical data about the problem 5. Patient and practitioner select shoe type

Table 28: Use Case 2 Description

5.3.3 Use Case UC3: Select non-medical options

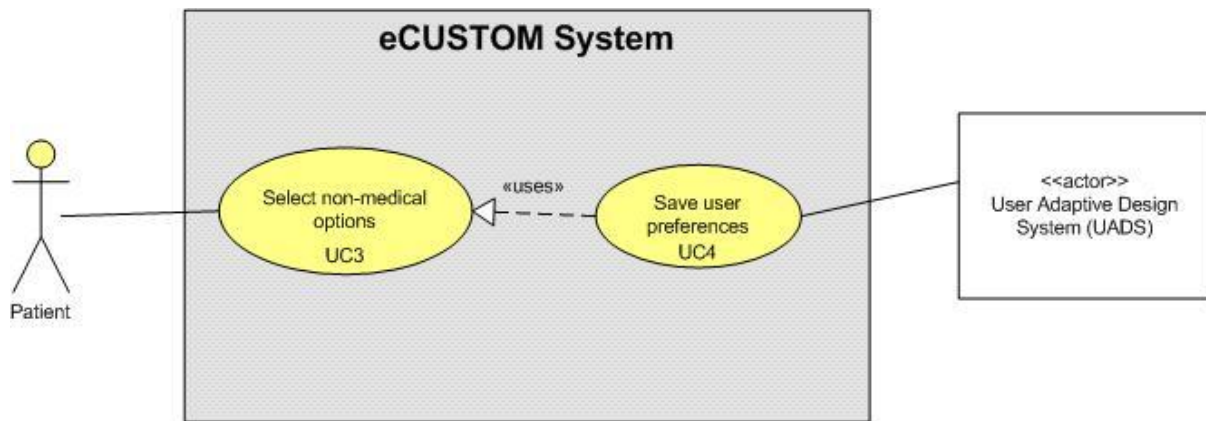


Figure 35: Select non-medical options Use Case Diagram

Use Case ID	UC3
Use Case Name	Select non-medical options
Goal/Purpose:	Customization of the appearance and texture of orthotics
Actors	Main actors: Patient Secondary actors: UADS
Preconditions and Postconditions	
Main Success Scenario (or Basic Flow):	<ol style="list-style-type: none"> The patient can select cosmetic options: <ul style="list-style-type: none"> Colours Engraving Top-cover materials Delivery time The e-CUSTOM system visualizes the options The patient selects his/her preferences and save them (<i>Go to UC4</i>)

Table 29: Use Case 3 Description

5.3.4 Use Case UC4: Save user preferences

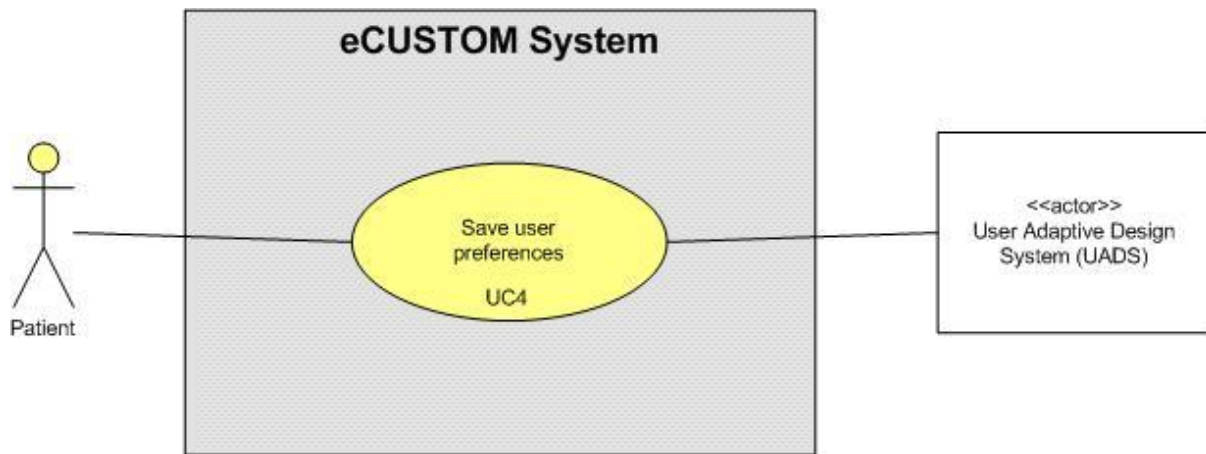


Figure 36: Save user preferences Use Case Diagram

Use Case ID	UC4
Use Case Name	Save user preferences
Goal/Purpose:	Store user non-medical options
Actors	Main actors: Patient Secondary actors: UADS
Preconditions and Postconditions	
Main Success Scenario (or Basic Flow):	<ol style="list-style-type: none"> 1. The patient stores his/her preferences 2. The e-CUSTOM system univocally associates selected preferences to the specific patient.

Table 30: Use Case 4 Description

5.3.5 Use Case UC5: Receive update on the order

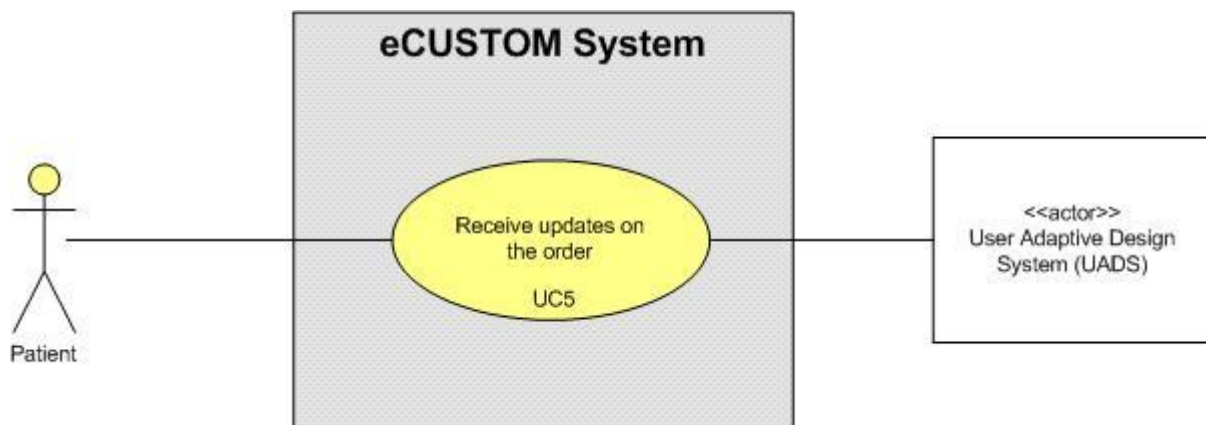


Figure 37: Receive updates on the order Use Case Diagram

Use Case ID	UC5
Use Case Name	Receive update on the order

Goal/Purpose:	Notify the user of significant changes on the order
Actors	Main actors: Patient Secondary actors: UADS
Preconditions and Postconditions	e-mail details of the patient need to be available
Main Success Scenario (or Basic Flow):	1. e-CUSTOM system notifies the user when a significant event occurs (e.g. the order has been received from laboratory)

Table 31: Use Case 5 Description

5.3.6 Use Case UC6: Track order

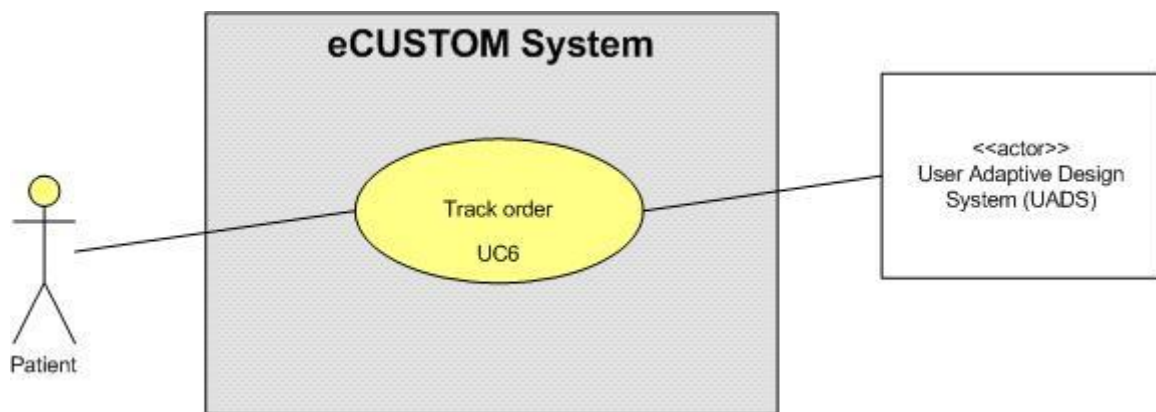


Figure 38: Track order Use Case Diagram

Use Case ID	UC6
Use Case Name	Track order
Goal/Purpose:	Track the status of the order
Actors	Main actors: Patient Secondary actors: UADS
Preconditions and Postconditions	
Main Success Scenario (or Basic Flow):	1. The patient logs in to the website from a remote location 2. e-CUSTOM system shows the current status into the web browser

Table 32: Use Case 6 Description

5.3.7 Use Case UC7: Insert information about practitioner

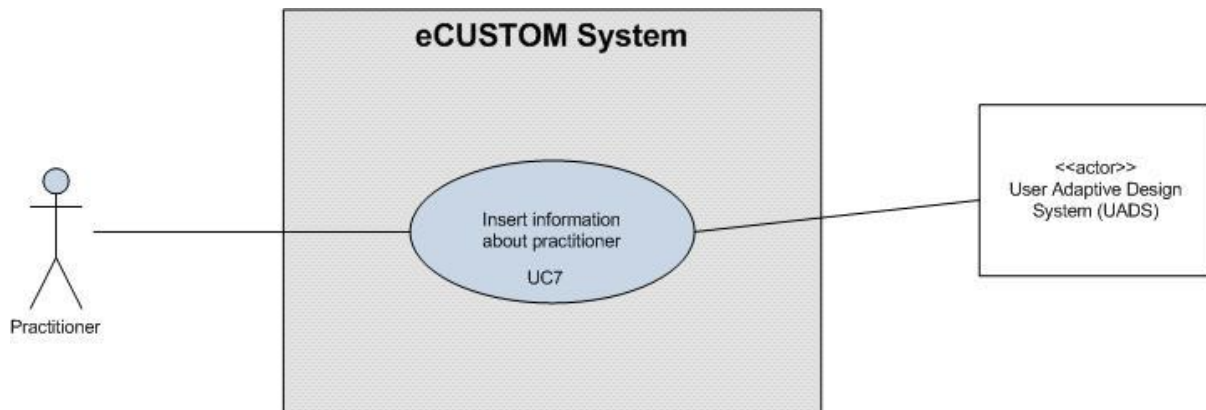


Figure 39: Insert information about practitioner Use Case Diagram

Use Case ID	UC7
Use Case Name	Insert information about practitioner
Goal/Purpose:	Provide an interface to upload information about practitioner
Actors	Main actors: Practitioner Secondary actors: UADS
Preconditions and Postconditions	
Main Success Scenario (or Basic Flow):	<ol style="list-style-type: none"> e-CUSTOM system allows to introduce information about the practitioner such as: <ul style="list-style-type: none"> Name Location Doctor credentials

Table 33: Use Case 7 Description

5.3.8 Use Case UC8: View status of orders

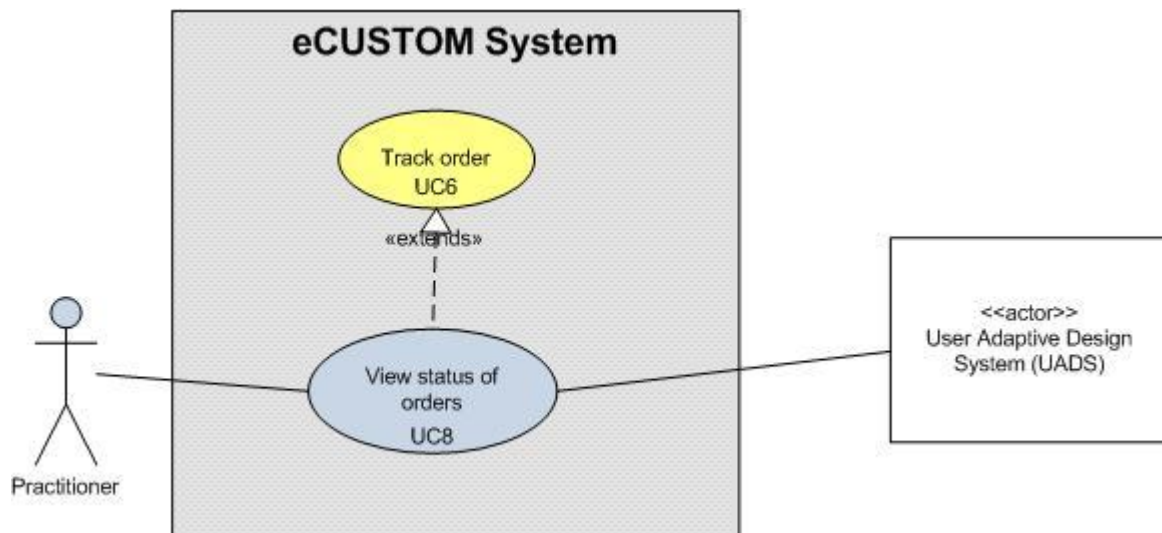


Figure 40: View status of orders Use Case Diagram

Use Case ID	UC8
Use Case Name	View status of orders
Goal/Purpose:	View indicator of the status of the orders
Actors	Main actors: Practitioner Secondary actors: UADS
Preconditions and Postconditions	
Main Scenario (or Basic Flow):	<ol style="list-style-type: none"> 1. e-CUSTOM system shows the current status into the web browser (“ready to send for design”, “sent for manufacture”, “complete”) 2. The practitioner can check more detail of the order

Table 34: Use Case 8 Description

5.3.9 Use Case UC9: Collect patient prescription

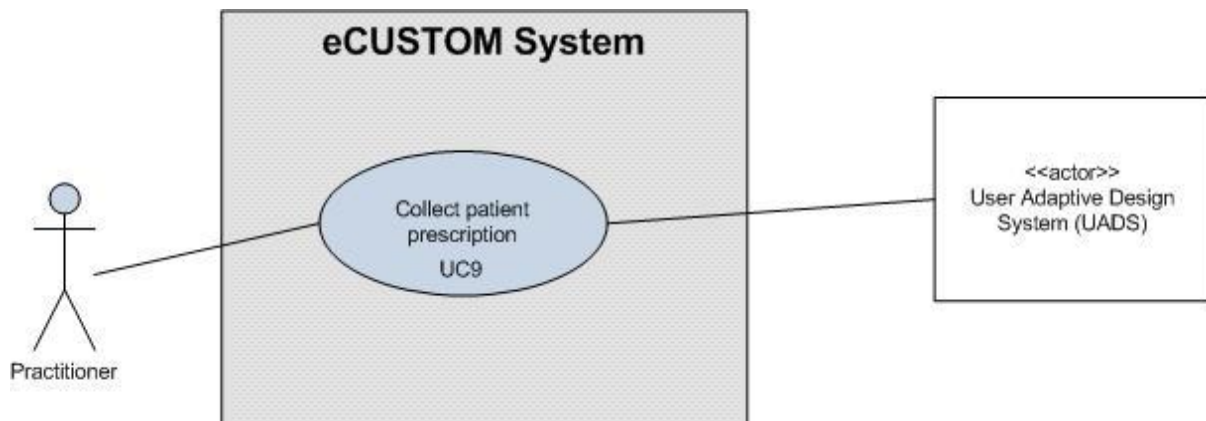


Figure 41: Collect patient prescription Use Case Diagram

Use Case ID	UC9
Use Case Name	Collect patient prescription
Goal/Purpose:	Build the prescription document
Actors	Main actors: Practitioner Secondary actors: UADS
Preconditions and Postconditions	The practitioner has examined physically the patient The practitioner has analysed the data within the software
Main Scenario (or Basic Flow):	<ol style="list-style-type: none"> 1. The practitioner elaborates the prescription for the orthotics including the following options for the general orthotic definition: <ul style="list-style-type: none"> • Type – e.g. men’s sports, woman’s dress • Material – e.g. polypropylene, EVA • Length – e.g. full foot, ¾ length

Table 35: Use Case 9 Description

5.3.10 Use Case UC10: Transfer data for design

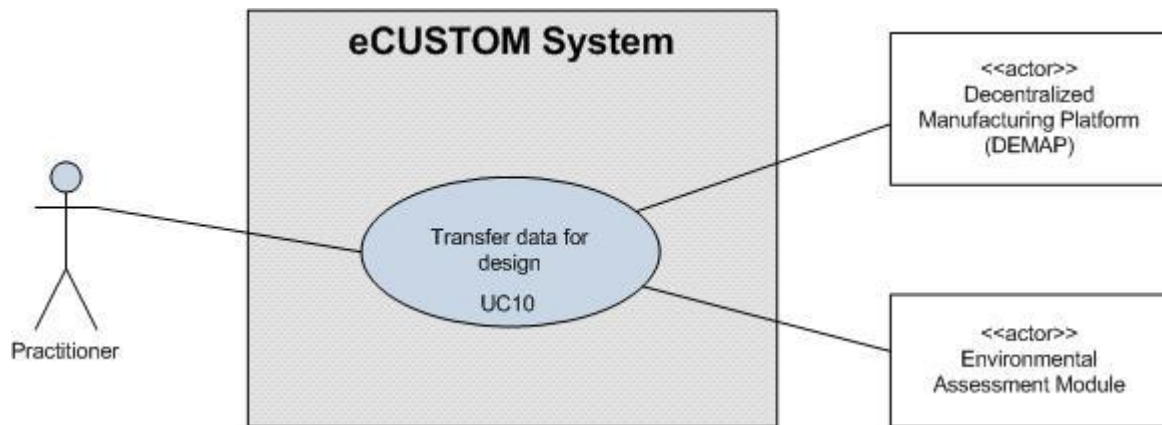


Figure 42: Transfer data for design Use Case Diagram

Use Case ID	UC10
Use Case Name	Transfer data for design
Goal/Purpose:	Sends the order to the design process
Actors	Main actors: Practitioner Secondary actors: DEMAP, Environmental Assessment Module
Preconditions and Postconditions	The practitioner has examined physically the patient The practitioner has analysed the data within the software
Main Success Scenario (or Basic Flow):	<ol style="list-style-type: none"> 1. e-CUSTOM systems shows the available designers and their associated environmental indexes 2. The practitioner selects a designer 3. The practitioner sends all data digitally collected to the Design laboratory as an order

Table 36: Use Case 10 Description

5.3.11 Use Case UC11: Visualise and Analyse patient foot data

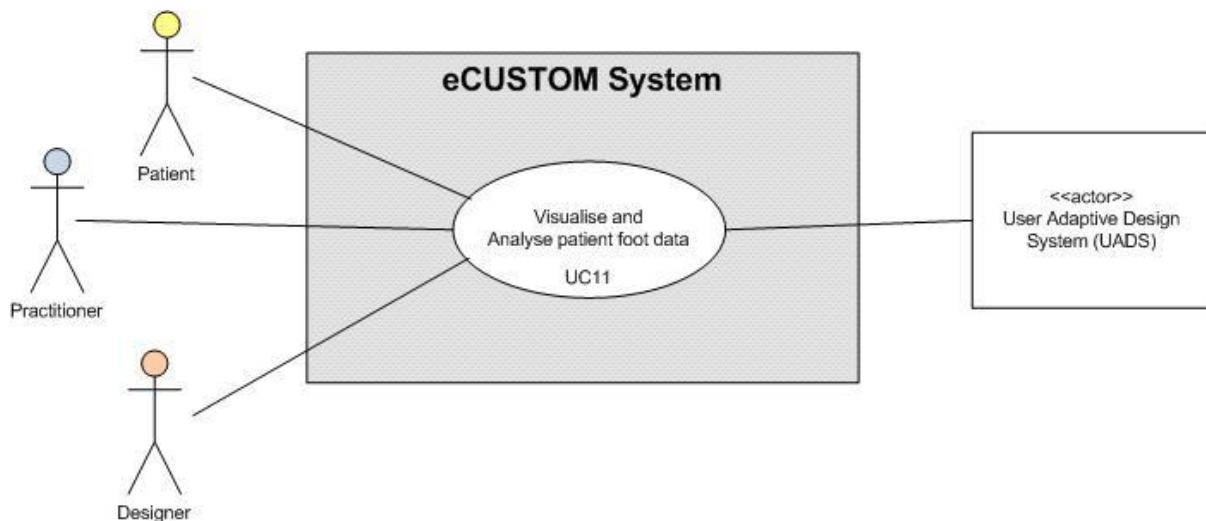


Figure 43: Visualise and Analyse patient foot data Use Case Diagram

Use Case ID	UC11
Use Case Name	Visualise and Analyse patient foot data
Goal/Purpose:	Provide visualization and analysis tools for the different actors involved
Actors	Main actors: Patient, Practitioner, Designer Secondary actors: UADS
Preconditions and Postconditions	
Main Success Scenario (or Basic Flow):	<i>Patient activities</i>
	<ol style="list-style-type: none"> 1. The practitioner is able to use the system to highlight problem areas to the patient. 2. The patient is able to view the collected data, in particular the foot scan, and analysis being done by the practitioner in initial consultation
	<i>Practitioner activities</i>
	<ol style="list-style-type: none"> 3. e-CUSTOM System visualizes scanned data 4. The practitioner verifies the data and highlight problem areas. 5. e-CUSTOM system provides tools to analyse the foot data which aid the consultation process. This may include: <ul style="list-style-type: none"> • Alignment of the scan • Size measurement from identified points on the scan (heel centre, heel bisector, metatarsals) • Measurements or color-maps showing deviation of the scan from “normal”.
	<i>Designer activities</i>
<ol style="list-style-type: none"> 6. e-CUSTOM system allows the designer to visualize the foot scan data 7. Designer determines if the data is acceptable to use as the basis for the design (<i>Go to UC16</i>) 8. e-CUSTOM system provides analysis tools for designers to aid with the design 	

Table 37: Use Case 11 Description

5.3.12 Use Case UC12: View prescription data

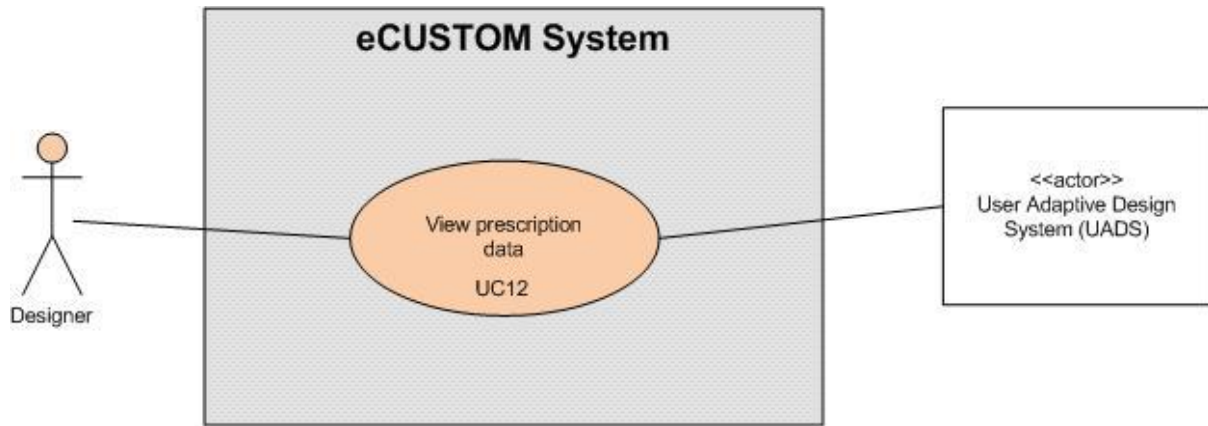


Figure 44: View prescription data Use Case Diagram

Use Case ID	UC12
Use Case Name	View prescription data
Goal/Purpose:	Provide visualization for prescription data
Actors	Main actors: Designer Secondary actors: UADS
Preconditions and Postconditions	
Main Success Scenario (or Basic Flow):	1. e-CUSTOM system allows the designer to get the required data from the prescription

Table 38: Use Case 12 Description

5.3.13 Use Case UC13: Insert information about designer

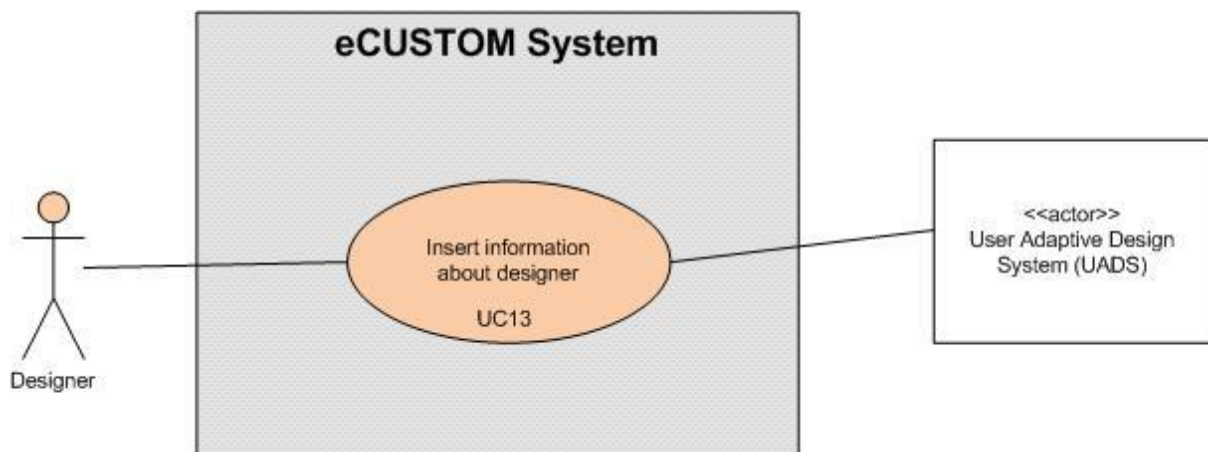


Figure 45: Insert information about designer Use Case Diagram

Use Case ID	UC13
Use Case Name	Insert information about designer

Goal/Purpose:	Maintain a database with data about designers
Actors	Main actors: Designer Secondary actors: UADS
Preconditions and Postconditions	
Main Success Scenario (or Basic Flow):	<ol style="list-style-type: none"> e-CUSTOM system allows to introduce information about the designer such as: <ul style="list-style-type: none"> Name Location

Table 39: Use Case 13 Description

5.3.14 Use Case UC14: Send to manufacturer

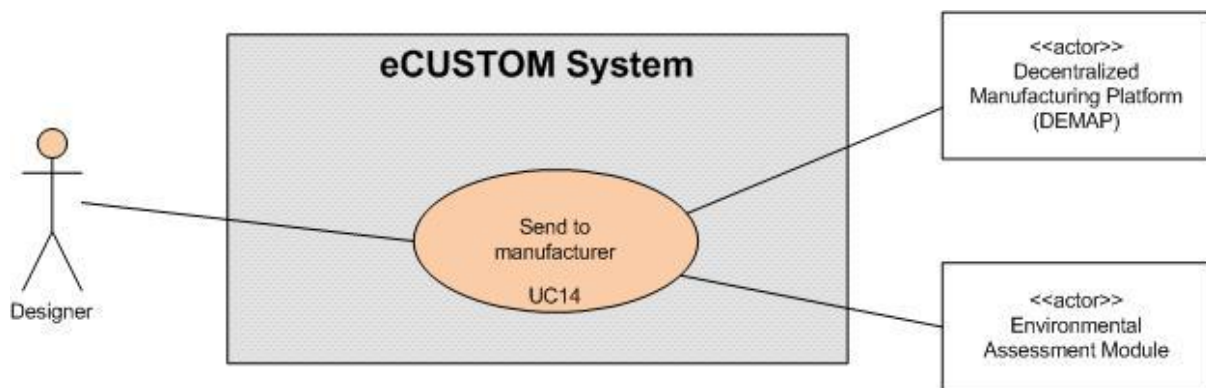


Figure 46: Send to manufacturer Use Case Diagram

Use Case ID	UC14
Use Case Name	Send to manufacturer
Goal/Purpose:	Sends the order to the manufacturing process
Actors	Main actors: Designer Secondary actors: DEMAP, Environmental Assessment Module
Preconditions and Postconditions	
Main Success Scenario (or Basic Flow):	<ol style="list-style-type: none"> e-CUSTOM system shows the available manufacturers and their associated environmental indexes The designer selects a manufacturer The designers send all data digitally collected to the Manufacturing laboratory as an order

Table 40: Use Case 14 Description

5.3.15 Use Case UC15: Orthotic design

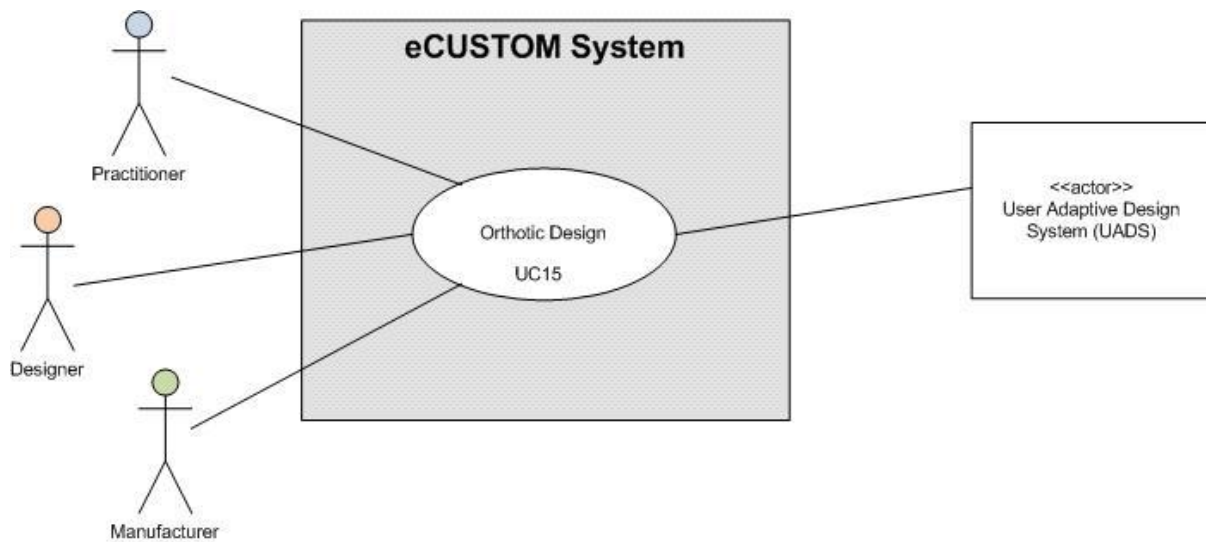


Figure 47: Orthotic design Use Case Diagram

Use Case ID	UC15
Use Case Name	Orthotic design
Goal/Purpose:	Provide tools for the design process for the different actors involved
Actors	Main actors: Practitioner, Designer, Manufacturer Secondary actors: DEMAP, Environmental Assessment Module
Preconditions and Postconditions	
Main Success Scenario (or Basic Flow):	<p><i>Practitioner activities</i></p> <ol style="list-style-type: none"> The practitioner participates in the design adding some elements in direct consultation with the patient: <ul style="list-style-type: none"> Type of shoe into which the orthotic is fitted Top covers materials and design(pattern) Personalized engravings <p><i>Designer activities</i></p> <ol style="list-style-type: none"> Based on the inputs from the practitioner (e.g. orthotic type, prescription & scan data), e-CUSTOM provide tools to create the final orthotic design for manufacture. Tools to modify the orthotic are: <ul style="list-style-type: none"> Non-corrective modifications, for example: <ul style="list-style-type: none"> Soft tissue expansion Arch raising or lowering Corrective modifications, for example: <ul style="list-style-type: none"> Postings (intrinsic & extrinsic) Shell specification (skives, flanges, heel cups, grooves and cut-outs)

	<ul style="list-style-type: none"> ▪ Additions (cushions, pads and extensions)
	<i>Manufacturer activities</i>
	<ol style="list-style-type: none"> 3. The manufacturer arranges one or more designs (from one or more orders) within a block of material for manufacture by milling or routing. 4. The manufacturer adds manufacturing specific design 5. e-CUSTOM system provides tools to all details to the design to allow manufacturing (e.g. pins to stabilise the product as it is being milled)

Table 41: Use Case 15 Description

5.3.16 Use Case UC16: Approve or reject the order

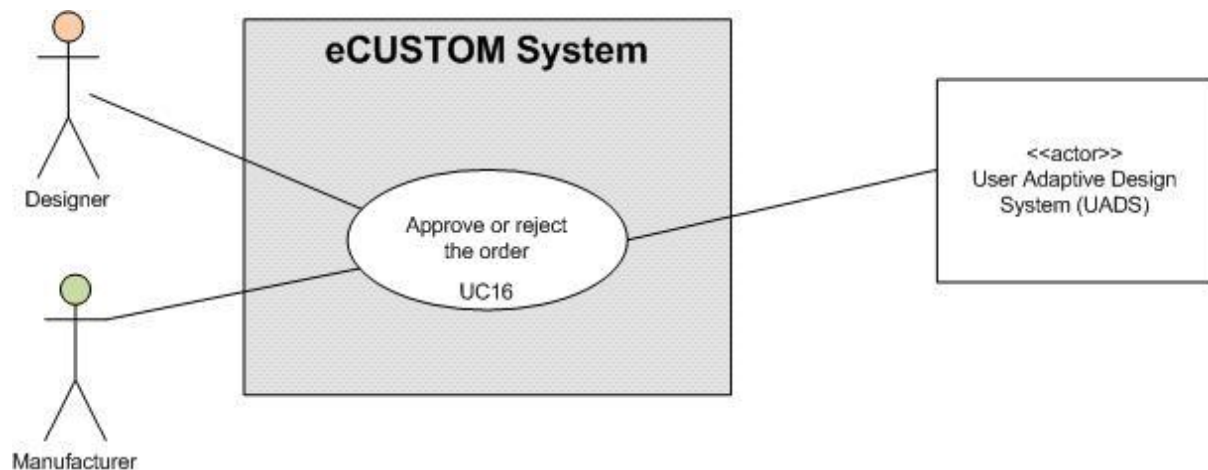


Figure 48: Approve or reject the order Use Case Diagram

Use Case ID	UC16
Use Case Name	Approve or reject the order
Goal/Purpose:	Validate the previous steps of the design process
Actors	Main actors: Designer, Manufacturer Secondary actors: UADS
Preconditions and Postconditions	
Main Success Scenario (or Basic Flow):	<i>Designer activities</i>
	<ol style="list-style-type: none"> 1. The designer checks the quality of data received from the practitioner's order 2. The designer approves or rejects the order 3. e-CUSTOM system changes the status of the order
	<i>Manufacturer activities</i>

	<ol style="list-style-type: none"> 4. The manufacturer checks the suitability of data received from the designer from manufacturing perspective 5. The manufacturer approves or rejects the order 6. e-CUSTOM system changes the status of the order
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Table 42: Use Case 16 Description

5.3.17 Use Case UC17: Insert information about manufacturer

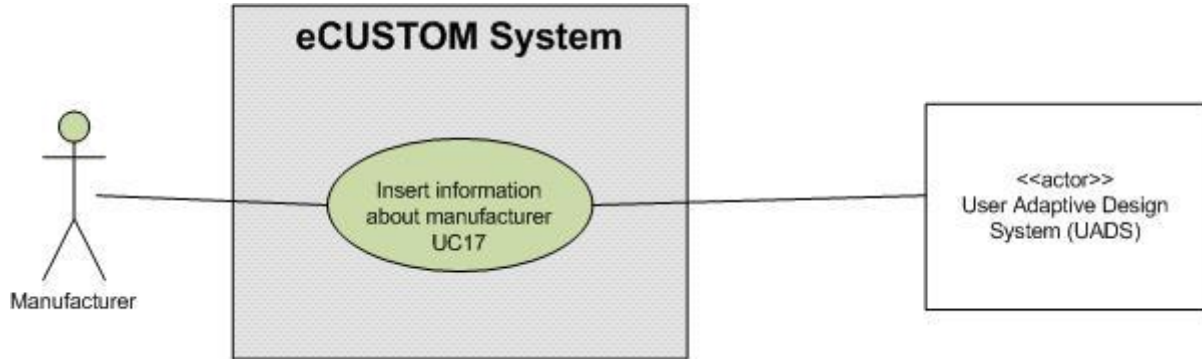


Figure 49: Insert information about manufacturer Use Case Diagram

Use Case ID	UC17
Use Case Name	Insert information about manufacturer
Goal/Purpose:	Maintain a database with data about manufacturers
Actors	Main actors: Manufacturer Secondary actors: UADS
Preconditions and Postconditions	
Main Success Scenario (or Basic Flow):	<ol style="list-style-type: none"> 1. e-CUSTOM system allows to introduce information about the manufacturer such as: <ul style="list-style-type: none"> • Name • Location

Table 43: Use Case 17 Description

5.3.18 Use Case UC18: Generate and send data for manufacture

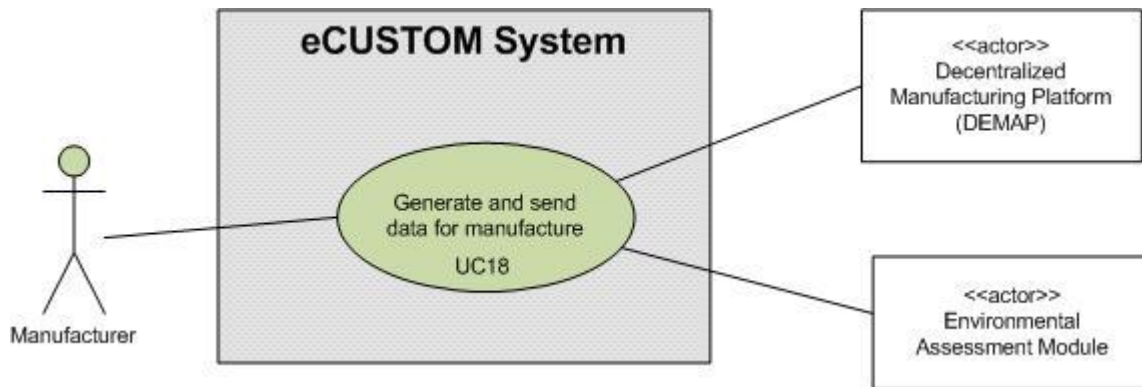


Figure 50: Generate and send data for manufacture Use Case Diagram

Use Case ID	UC18
Use Case Name	Generate and send data for manufacturer
Goal/Purpose:	Maintain a database with data about manufacturers, procedures
Actors	Main actors: Manufacturer Secondary actors: DEMAP, Environmental Assessment Module
Preconditions and Postconditions	
Main Success Scenario (or Basic Flow):	<ol style="list-style-type: none"> 1. The manufacturer generates specific data for manufacture depending on the manufacturing process required. Additive manufacturing would have different requirements (e.g. a closed STL (triangle) model) on the design compared to milling (e.g. toolpaths to drive the milling machine). 2. The manufacturer sends data to manufacturing machine(miller, router, additive manufacture) to create the orthotic

Table 44: Use Case 18 Description

5.4 Step 3 – Mapping operational requirements on processes and activities with the defined pylons:

The second column of the following table defines in which Pylon each Use Case is situated. Since Pylon IV supports coverage for the whole data exchange infrastructure it is considered to affect all Use Cases.

Use Case	Pylon	As-is	To-Be
Use Case UC1: Collect patient personal data	Pylon I	The patient attends initial consultation with a practitioner and gives personal data in person/by verbal means.	The patient attends initial consultation and together with the practitioner introduces personal data into a web interface application.
	Pylon IV	Ice.NET/CP user management	
Use Case UC2: Collect patient foot data	Pylon I	The patient is measured with a rule or a cast taken or a foam box impression made	The patient's feet are scanned
	Pylon IV	CP document management	Custom product structure for orthotics
Use Case UC3: Select non-medical options	Pylon I	Verbal interaction and add to paper order form	Discussion and choice taken from selection of images on the computer and the choice logged in the order
	Pylon IV		Custom product structure for orthotics
Use Case UC4: Save user preferences	Pylon I	Data stored in filing cabinet	All data recorded will be kept online for browsing at later appointments
	Pylon IV	Ice.NET/CP User/Roles management	
Use Case UC5: Receive update on the order	Pylon I	The order has to be sent to the production centre by courier leading to possible delays and loss	The order and additional comments are all tracked electronically and securely.
	Pylon IV	Ice.NET lifecycle management	Custom orthotics lifecycle
Use Case UC6: Track order	Pylon I	The tracking typically is inaccurate being a best guess of the state of the order. This is especially limited when the order includes a physical cast or foam box and it necessitates more stages in manufacture and delays in postal services.	The electronic order includes all the data to design and manufacture the orthotic. Each step of the process can be logged and can be therefore be tracked online. (Like a courier UPS package.)
	Pylon IV	Ice.NET lifecycle management	Custom attributes Custom orthotics lifecycle
Use Case UC7: Insert information	Pylon I	Part of the paper order form	The laboratory and practitioner have secure online customised accounts

Use Case	Pylon	As-is	To-Be
about practitioner	Pylon IV	Ice.NET/CP User/Roles management	
Use Case UC8: View status of orders	Pylon I	Cannot be done	Status of the order is available online
	Pylon IV	Ice.NET lifecycle management	Custom orthotics lifecycle
Use Case UC9: Collect patient prescription	Pylon I	Paper prescription form is filled in	The prescription is filled in online with the patient along with alignment corrections to the patient's scan
	Pylon IV	Ice.NET/CP user management	Custom attributes in user management
Use Case UC10: Transfer data for design	Pylon II	Postal or courier service	Secure online order creation sends the whole package of data and prescription DEMAP is used to retrieve data for the available design laboratory (location, cost etc.). Suggestion on which one to select based on a multiple criteria decision making method is also provided.
	Pylon III	Environmental index of the designer is not considered in the state of the art designer selection process	e-CUSTOM system shows the available designers and their associated environmental indexes. This data will be considered in the final selection of designer
	Pylon IV		Data exchange component for orthotic product structure
Use Case UC11: Visualise and Analyse patient foot data	Pylon I	None available	The patient can see the scan of their feet. The practitioner can make corrections and measurements to identify the origin of the symptoms in a 3D view with the patient alongside
	Pylon IV		Custom product structure for orthotics Master/Revision management
Use Case UC12: View prescription data	Pylon I	The prescription is passed along the prescription line	The order is available for printing with barcode assignment. The bar code of the order will track the order in and out of states in the production centre

Use Case	Pylon	As-is	To-Be
	Pylon IV	CP document management	Custom attributes for prescription data
Use Case UC13: Insert information about designer	Pylon I	Any monitoring of the personnel involved in the process is by signature so not common	The use of bar codes allows the management of productivity and accountability of quality
	Pylon IV	Ice.NET/CP user management	
Use Case UC14: Send to manufacturer	Pylon II	The completed orthotic is sent back by courier. Tracking would typically only be done from the production end.	The completed orthotic is sent back to the practitioner and the online order updated and an email sent to the practitioner and the customer
	Pylon III	Environmental Index of the manufacturer is not taken into account in the manufacturer selection	e-CUSTOM system shows the available manufacturers and their associated environmental indexes. The environmental index of the manufacturer is a key factor in the final selection of the manufacturer
	Pylon IV	CP document management E-mail notification	
Use Case UC15: Orthotic design	Pylon I	The design is a skilled craft using the cast or foam model as a template	Templates are stored in an electronic library and matching to the scan dynamically and visually shown by colour mapping
	Pylon IV		Custom product structure for orthotics Master/Revision management
Use Case UC16: Approve or reject the order	Pylon I	The initial order would be approved manually and if rejected a telephone call made to resolve the issue	Approval of the order is made by verifying the electronic data that is all in one place. If the data is incomplete then the order can be rejected and the practitioner warned by email and tracking online.
	Pylon IV	Ice.NET lifecycle management	Custom orthotics lifecycle
Use Case UC17: Insert information about manufacturer	Pylon I	The manufacturer's information is only visible on the order form	The manufacturer has the ability to market themselves by interaction through the software. The software can be customised to the manufacturer. The software can be updated at any time to send news or "special offers". The software creates a more inclusive

Use Case	Pylon	As-is	To-Be
			environment that encourages the practitioner to use their services and not a competitor's.
	Pylon IV	Ice.NET/CP user management	
Use Case UC18: Generate and send data for manufacture	Pylon II	Data is sent by postal or courier services. Further communication is by telephone.	All data is digital and updated in real time allowing precise tracking and communication between practitioner and production centre DEMAP is used to suggest between different manufacturers based on the data that each manufacturer has uploaded.
	Pylon III	Not available	The manufacturer evaluates the environmental index of each of the process steps and generates specific data for manufacture depending on the manufacturing process required.
	Pylon IV	CP document management E-mail notification	

Table 45: Mapping operational requirements on processes and activities with the defined pylons

5.5 Step 4 – Definition of the implementation strategy

By examining the existing situation and comparing it with that envisioned in the use case, it is possible to highlight those activities that are already performed in common industrial contexts, those that are already performed but need to be adapted to fit the e-CUSTOM solution, and those that have to be developed from scratch. The Table 46 lists the implementation strategies for the Specific UADS and the Table 47 for the Generic UADS.

5.5.1 Implementation strategies for Specific UADS

Use Case	Pylon	To-Be	Implementation category	Technological aspects (if necessary)
Use Case UC1: Collect patient personal data	Pylon I	The patient attends initial consultation and together with the practitioner introduces personal data into a web interface application.	<input type="checkbox"/> No changes needed <input type="checkbox"/> Modifications required <input checked="" type="checkbox"/> New implementation	e-CUSTOM UADS web-based software will be developed to allow the collection of patient's personal data
	Pylon IV			
Use Case UC2: Collect patient foot data	Pylon I	The patient's feet are scanned	<input type="checkbox"/> No changes needed <input checked="" type="checkbox"/> Modifications required <input type="checkbox"/> New implementation	Integration of scanner into the workflow. Desktop software will be created and will pass data to the Web application.
	Pylon IV	Custom product structure for orthotics		
Use Case UC3: Select non-medical options	Pylon I	Discussion and choice taken from selection of images on the computer and the choice logged in the order	<input type="checkbox"/> No changes needed <input type="checkbox"/> Modifications required <input checked="" type="checkbox"/> New implementation	Desktop software will be created and results passed to the web-based order tracking software for production.
	Pylon IV	Custom product structure for orthotics		
Use Case UC4: Save user preference	Pylon I	All data recorded will be kept online for browsing at later appointments	<input type="checkbox"/> No changes needed <input type="checkbox"/> Modifications required <input checked="" type="checkbox"/> New implementation	e-CUSTOM UADS local software will be developed to allow the users' preferences to be saved. Personal data will not be passed over the web for data protection reasons.
	Pylon IV			
Use Case UC5: Receive update on the order	Pylon I	The order and additional comments are all tracked electronically and securely.	<input type="checkbox"/> No changes needed <input type="checkbox"/> Modifications required <input checked="" type="checkbox"/> New implementation	Updates will be tracked over the web and though automated e-mail. e-CUSTOM UADS web-based software will be developed to allow online tracking of the order
	Pylon IV	Custom orthotics lifecycle		

Use Case	Pylon	To-Be	Implementation category	Technological aspects (if necessary)
Use Case UC6: Track order	Pylon I	The electronic order includes all the data to design and manufacture the orthotic. Each step of the process can be logged and can be therefore be tracked online. (Like a courier UPS package.)	<input type="checkbox"/> No changes needed <input type="checkbox"/> Modifications required <input checked="" type="checkbox"/> New implementation	e-CUSTOM UADS web-based software will be developed to allow online tracking of the order
	Pylon IV	Custom attributes Custom orthotics lifecycle		
Use Case UC7: Insert information about practitioner	Pylon I	The laboratory and practitioner have secure online customised accounts	<input type="checkbox"/> No changes needed <input type="checkbox"/> Modifications required <input checked="" type="checkbox"/> New implementation	e-CUSTOM UADS web-based software will be developed for invoicing and shipping.
	Pylon IV			
Use Case UC8: View status of orders	Pylon I	Status of the order is available online	<input type="checkbox"/> No changes needed <input type="checkbox"/> Modifications required <input checked="" type="checkbox"/> New implementation	e-CUSTOM UADS web-based software will be developed to allow online tracking of the status of the order
	Pylon IV	Custom orthotics lifecycle		
Use Case UC9: Collect patient prescription	Pylon I	The prescription is filled in online with the patient along with alignment corrections to the patient's scan	<input type="checkbox"/> No changes needed <input type="checkbox"/> Modifications required <input checked="" type="checkbox"/> New implementation	e-CUSTOM UADS desktop software will be developed and upload to allow online prescription communication
	Pylon IV	Custom attributes in user management		

Use Case	Pylon	To-Be	Implementation category	Technological aspects (if necessary)
Use Case UC10: Transfer data for design	Pylon II	Secure online order creation sends the whole package of data and prescription DEMAP is used to retrieve data for the available design laboratory (location, cost etc.). Suggestion on which one to select based on a multiple criteria decision making method is also provided.	<input type="checkbox"/> No changes needed <input type="checkbox"/> Modifications required <input checked="" type="checkbox"/> New implementation	e-CUSTOM DEMAP, EAM web-based software and decision making algorithm will be developed
	Pylon III	e-CUSTOM system shows the available designers and their associated environmental indexes. This data will be considered in the final selection of designer		
	Pylon IV	Data exchange component for orthotic product structure		
Use Case UC11: Visualise and Analyse patient foot data	Pylon I	The patient can see the scan of their feet. The practitioner can make corrections and measurements to identify the origin of the symptoms in a 3D view with the patient alongside	<input type="checkbox"/> No changes needed <input type="checkbox"/> Modifications required <input checked="" type="checkbox"/> New implementation	Software will be written in the desktop app. to analyse the scan of the patient.
	Pylon IV	Custom product structure for orthotics Master/Revision management		
Use Case UC12: View prescription data	Pylon I	The order is available for printing with barcode assignment. The bar code of the order will track the order in and out of states in the production centre	<input type="checkbox"/> No changes needed <input type="checkbox"/> Modifications required <input checked="" type="checkbox"/> New implementation	e-CUSTOM UADS web-based software will be developed to track the order
	Pylon IV	Custom attributes for prescription data		

Use Case	Pylon	To-Be	Implementation category	Technological aspects (if necessary)
Use Case UC13: Insert information about designer	Pylon I	The use of bar codes allows the management of productivity and accountability of quality	<input type="checkbox"/> No changes needed <input type="checkbox"/> Modifications required <input checked="" type="checkbox"/> New implementation	Patient reference will be tracked with the order.
	Pylon IV			
Use Case UC14: Send to manufacturer	Pylon II	The completed orthotic is sent back to the practitioner and the online order updated and an email sent to the practitioner	<input type="checkbox"/> No changes needed <input type="checkbox"/> Modifications required <input checked="" type="checkbox"/> New implementation	e-CUSTOM DEMAP, EAM web-based software will be developed to pass data to manufacturer's desktop application.
	Pylon III	e-CUSTOM system shows the available manufacturers and their associated environmental indexes. The environmental index of the manufacturer is one of the key factors in the final selection of the manufacturer		
	Pylon IV			
Use Case UC15: Orthotic design	Pylon I	Templates are stored in an electronic library and matching to the scan dynamically and visually shown by colour mapping	<input type="checkbox"/> No changes needed <input type="checkbox"/> Modifications required <input checked="" type="checkbox"/> New implementation	New design s/w is expected to be written for the desktop application.
	Pylon IV	Custom product structure for orthotics Master/Revision management		
Use Case UC16: Approve or reject the order	Pylon I	Approval of the order is made by verifying that the electronic data is all in one place. If the data is incomplete then the order can be rejected and the practitioner warned by email and tracking online.	<input type="checkbox"/> No changes needed <input type="checkbox"/> Modifications required <input checked="" type="checkbox"/> New implementation	e-CUSTOM UADS web-based software will be developed to track the state of the order.
	Pylon IV	Custom orthotics lifecycle		

Use Case	Pylon	To-Be	Implementation category	Technological aspects (if necessary)
Use Case UC17: Insert information about manufacturer	Pylon I	The manufacturers have the ability to market themselves by interaction through the software. The software can be customised to the manufacturer. The software can be updated any time to send news or "special offers". The software creates a more inclusive environment that encourages the practitioner to use their services and not a competitor's.	<input type="checkbox"/> No changes needed <input type="checkbox"/> Modifications required <input checked="" type="checkbox"/> New implementation	e-CUSTOM UADS web-based software will be developed so that the manufacturers' can insert their information
	Pylon IV			
Use Case UC18: Generate and send data for manufacturer	Pylon II	All data is digital and updated in real time allowing precise tracking and communication between practitioner and production centre DEMAP is used to suggest between different manufacturers based on the data that each manufacturer has uploaded.	<input type="checkbox"/> No changes needed <input type="checkbox"/> Modifications required <input checked="" type="checkbox"/> New implementation	e-CUSTOM DEMAP, EAM web-based software will be developed to pass data to manufacturer's desktop application.
	Pylon III	The manufacturer evaluates the environmental index of each of the process steps and generates specific data for manufacture depending on the manufacturing process required.		
	Pylon IV			

Table 46: Implementation Strategy for Specific UADS

5.5.2 Implementation strategies for Generic UADS

Functionality	Pylon	To-Be	Implementation category	Technological aspects (if necessary)
Collect customer personal data	Pylon I	The customer together with the sales representative introduces personal data into a web interface application.	<input type="checkbox"/> No changes needed <input type="checkbox"/> Modifications required <input checked="" type="checkbox"/> New implementation	e-CUSTOM UADS web-based software will be developed to allow the collection of customer's personal data
	Pylon IV			
Select accessory's options	Pylon I	Discussion and choice taken from selection of images on the computer and the choice logged in the order	<input type="checkbox"/> No changes needed <input checked="" type="checkbox"/> Modifications required <input type="checkbox"/> New implementation	Existing web-based software will be redesigned/modified
	Pylon IV			
Use Case UC4: Save user preference	Pylon I	All data recorded will be kept online for browsing at later appointments	<input type="checkbox"/> No changes needed <input type="checkbox"/> Modifications required <input checked="" type="checkbox"/> New implementation	e-CUSTOM UADS web-based software will be developed to allow the users' preferences to be saved
	Pylon IV			
Use Case UC5: Receive update on the order	Pylon I	The order and additional comments are all tracked electronically and securely.	<input type="checkbox"/> No changes needed <input type="checkbox"/> Modifications required <input checked="" type="checkbox"/> New implementation	e-CUSTOM UADS web-based software will be developed to allow online tracking of the order
	Pylon IV			

Functionality	Pylon	To-Be	Implementation category	Technological aspects (if necessary)
Use Case UC6: Track order	Pylon I	The electronic order includes all the data to design and manufacture the orthotic. Each step of the process can be logged and can be therefore be tracked online. (Like a courier UPS package.)	<input type="checkbox"/> No changes needed <input type="checkbox"/> Modifications required <input checked="" type="checkbox"/> New implementation	e-CUSTOM UADS web-based software will be developed to allow the customer to track the order online
	Pylon IV	Custom attributes Custom orthotics lifecycle		
Insert information about sales representative	Pylon I	The OEM and sales representative have secure online customised accounts	<input type="checkbox"/> No changes needed <input type="checkbox"/> Modifications required <input checked="" type="checkbox"/> New implementation	e-CUSTOM UADS web-based software will be developed
	Pylon IV			
Use Case UC8: View status of orders	Pylon I	Status of the order is available online	<input type="checkbox"/> No changes needed <input type="checkbox"/> Modifications required <input checked="" type="checkbox"/> New implementation	e-CUSTOM UADS web-based software will be developed to allow online tracking of the status of the order
	Pylon IV			
Attach comments on order	Pylon I	The prescription is filled in online with the patient along with alignment corrections to the patient's scan	<input type="checkbox"/> No changes needed <input type="checkbox"/> Modifications required <input checked="" type="checkbox"/> New implementation	e-CUSTOM UADS web-based software will be developed to allow online order comments composition
	Pylon IV	Custom attributes in user management		

Functionality	Pylon	To-Be	Implementation category	Technological aspects (if necessary)
Use Case UC10: Transfer data for design	Pylon II	Secure online order creation sends the whole package of order information (data and attached comments) DEMAP is used to retrieve data for the available design laboratory (location, cost etc.). Suggestion on which one to select based on a multiple criteria decision making method is also provided.	<input type="checkbox"/> No changes needed <input type="checkbox"/> Modifications required <input checked="" type="checkbox"/> New implementation	e-CUSTOM DEMAP, EAM web-based software and decision making algorithm will be developed
	Pylon III	e-CUSTOM system shows the available designers and their associated environmental indexes. This data will be considered in the final selection of designer		
	Pylon IV	Data exchange component for orthotic product structure		
Use Case UC13: Insert information about designer	Pylon I	The use of bar codes allows the management of productivity and accountability of quality	<input type="checkbox"/> No changes needed <input type="checkbox"/> Modifications required <input checked="" type="checkbox"/> New implementation	e-CUSTOM UADS web-based software will be developed for the insertion of information about designer
	Pylon IV			

Functionality	Pylon	To-Be	Implementation category	Technological aspects (if necessary)
Use Case UC14: Send to manufacturer	Pylon II	The completed order is sent back to the sales representative and the online order updated and an email sent to the practitioner	<input type="checkbox"/> No changes needed <input type="checkbox"/> Modifications required <input checked="" type="checkbox"/> New implementation	e-CUSTOM DEMAP, EAM web-based software will be developed
	Pylon III	e-CUSTOM system shows the available manufacturers and their associated environmental indexes. The environmental index of the manufacturer is one of the key factors in the final selection of the manufacturer		
	Pylon IV			
Use Case UC16: Approve or reject the order	Pylon I	Approval of the order is made by verifying that the electronic order data is all in one place. If the data is incomplete then the order can be rejected and the sales representative warned by email and tracking online.	<input type="checkbox"/> No changes needed <input type="checkbox"/> Modifications required <input checked="" type="checkbox"/> New implementation	e-CUSTOM UADS web-based software will be developed
	Pylon IV	Custom orthotics lifecycle		

Functionality	Pylon	To-Be	Implementation category	Technological aspects (if necessary)
Use Case UC17: Insert information about manufacturer	Pylon I	The manufacturers have the ability to market themselves by interaction through the software. The software can be customised to the manufacturer. The software can be updated any time to send news or "special offers". The software creates a more inclusive environment that encourages the practitioner to use their services and not a competitor's.	<input type="checkbox"/> No changes needed <input type="checkbox"/> Modifications required <input checked="" type="checkbox"/> New implementation	e-CUSTOM UADS web-based software will be developed so that the manufacturers' can insert their information
	Pylon IV			
Use Case UC18: Generate and send data for manufacturer	Pylon II	All data is digital and updated in real time allowing precise tracking and communication between sales representative and production centre DEMAP is used to suggest between different manufacturers based on the data that each manufacturer has uploaded.	<input type="checkbox"/> No changes needed <input type="checkbox"/> Modifications required <input checked="" type="checkbox"/> New implementation	e-CUSTOM DEMAP, EAM web-based software will be developed
	Pylon III	The manufacturer evaluates the environmental index of each of the process steps and generates specific data for manufacture depending on the manufacturing process required.		
	Pylon IV			

Table 47: Implementation Strategy for Generic UADS

5.6 Step 5 – Identification of verification and acceptance criteria

In the following table the identified acceptance criteria for the pilot case are summarized:

Criteria	Acceptance criteria designation	Objective
1	Number of orthotics ordered though e-Custom process / Number of orthotics delivered by practitioner	>50% after 12 months
2	Number of orthotics ordered though e-Custom process / Number of orthotics manufactured at milling centre	>30% after 12 months
3	e-Custom process tracking time by practitioner with milling centre / Current process tracking time	< 50 %
4	Labour time per pair e-Custom / Labour time per pair current manual process	< 30 %
5	Lead time with e-Custom process / Lead time with current manual process	< 25 %
6	Environment: to decrease each year the number of kilometers between OEM, suppliers and dealer: number of kilometers per year?	-10%/year
7	Production cost e-Custom process / production cost of current manual process	< 75 %
8	Number of orthotics ordered though e-Custom process / Number of orthotics delivered by practitioner	>50% after 12 months
9	Number of orthotics ordered though e-Custom process / Number of orthotics manufactured at milling centre	>30% after 12 months

Table 48: Acceptance Criteria

Regarding Software:

Criteria	Acceptance criteria designation	Objective
1	Send a survey of customer satisfaction to all end-users (ergonomics, efficiency, fluidity of interface)	To obtain a global note >7/10

Table 49: Acceptance Criteria regarding software

6 CONCLUSIONS

In this document the Use Cases of the Automotive and Healthcare Pilot Scenarios have been identified and described extensively. Moreover the Operational Processes have been formalized through Use Case Diagrams and Activity Diagrams that improved the understanding of the workflow. Furthermore technological aspects that need improvement or implementation have been defined. Finally acceptance criteria have been identified for both cases.