

A Framework for Evaluating and Improving Requirement Specifications Based on the Developers and Testers Perspective – Technical Report

Ana Carolina Oran¹, Gleison Santos², Bruno Gadelha¹, Tayana Conte¹
{ana.oran, tayana} @icomp.ufam.edu.br, gleison.santos@uniriotec.br

¹USES Research Group

¹ Federal University of Amazonas (UFAM)
Manaus – AM – Brazil

² Federal University of the State of Rio de Janeiro (UNIRIO)
Rio de Janeiro – RJ – Brazil



USES Technical Report

RT-USES-2020-005

June 2020

Institute of Computing (IComp)

Federal University of Amazonas (UFAM)

Manaus, Amazonas 69077-000

A Framework for Evaluating and Improving Requirements Specifications Based on the Developers and Testers Perspective – Technical Report

Ana Carolina Oran¹, Gleison Santos², Bruno Gadelha¹, Tayana Conte¹
{ana.oran, tayana} @icomp.ufam.edu.br, gleison.santos@uniriotec.br

¹USES Research Group

¹ Federal University of Amazonas (UFAM)
Manaus – AM – Brazil

² Federal University of the State of Rio de Janeiro (UNIRIO)
Rio de Janeiro – RJ – Brazil

Abstract:

This technical report presents the artifacts we used in two empirical studies. All the participants signed the informed consent form, a characterization questionnaire. Besides, at the end of each cycle, all participants answered an evaluation questionnaire about the ease of use and the usefulness of ReComp based on the Technology Acceptance Model (TAM). In the first one, we evaluate the ReComp (v1) for the user stories artifact from the perspective of developers. In the second study, we evaluate the ReComp (v2) for the use case and prototypes artifact from the perspective of software testers.

Consent Form

Dear participant, we are pleased to invite you to participate in the research “Framework to evaluate and improve the artifacts used by development teams in communicating requirements in software projects”, under the responsibility of the responsible researcher and doctoral student Ana Carolina Oran Rocha Graduate Program in Informatics at UFAM (PPGI / UFAM), at Av. Rodrigo Otávio, nº 6200, Senador Arthur Virgílio Filho University Campus, Setor Norte, Bloco 10, Coroado 1, e-mail ana.oran@icomp.ufam.edu.br and landline (92) 36672130, together with supervising professor Dra. Tayana Conte Uchôa from the Institute of Computing (ICOMP / UFAM), at Av. Rodrigo Otávio, nº 6200, Campus Universitário Senador Arthur Virgílio Filho, Setor Norte, Bloco 10, Coroado 1, e-mail tayana@icomp.ufam.edu.br and telephone (92) 3305-1181 ext. 2004. This work aims to support the communication of requirements based on the perspective of the members development teams and software, such as: developer and tester.

In this way, your collaboration will be through participation in a questionnaire, in which photographic records and/or through video recordings will be made. These data will only be used for scientific research purposes, maintaining the confidentiality of their identification.

Your participation will be voluntary, with no expense or reward, in addition to having the right and the freedom to withdraw at any time from the research.

To participate in the research, you must be an undergraduate and graduate student of the Computer Science and/or Information Systems course at UFAM or any educational institution in Brazil with knowledge in Software Engineering. Or even be professionals in the software industry (individuals who have completed Higher Education) and who act as developers and testers. Besides, you must be of age (at least 18 years old) and can be of any gender, race or social class.

However, individuals who do not participate in the initial training or who miss one of the stages of the study will not be considered for the study. Moreover, individuals who do not feel comfortable during the execution of the study will be released, and the data collected from this participant until the moment of withdrawal will be disregarded.

Any doubts can be clarified, and your withdrawal will not cause any physical or mental damage. For any other information, you may contact the researcher in charge, an advisor professor at the above mentioned contacts or you may contact the Research Ethics Committee - CEP / UFAM, at Rua Teresina, 495, Adrianópolis, telephone (92) 3305-1181, mobile (92) 9171-2496, ext. 2004, e-mail: cep.ufam@gmail.com.

The questionnaire, although simple to be applied, is an instrument that can eventually cause some embarrassment or even tiredness of that person responding to it. However, we emphasize that the participants are completely free to stop answering it, and even if they don't want to and/or interrupt their participation in the research if they feel better. We also guarantee their anonymity. If at some point in the conduct of the questionnaire, you feel embarrassed due to the lack of understanding of the questions, terms, or expressions used, the responsible researcher will use ethical or academic professionalism to overcome such situations.

We emphasize that no biological sample will be used in any activity, as the research will be carried out with human beings and not on human beings.

As all research with human beings offers risks, the risks arising from their participation are in mental constraint or fatigue. The participant may interrupt his participation at any time if he feels any discomfort of this nature. Moreover, if the participant suffers any damage / psychological shock, we will send it to the Service Center for Applied Psychology at UFAM (CSPA).

Participants will be guaranteed reimbursement of expenses they may have incurred for surveying as provided for in item IV.3.g, of CNS Resolution No. 466 of 2012. Participants will also have the right to receive indemnities and coverage for material damages according to CNS Resolution No. 466 of 2012, IV.3.h, IV.4.c and V.7.

The results of the research will be analyzed and published, but your identity will not be disclosed and will be kept confidential. This way, the participants will have the rights reserved, where: the answers will be confidential; the questionnaire will not be identified by name to maintain anonymity, and participants will receive prior clarification about the research.

On the other hand, as expected benefits, we anticipate that participants will benefit from the knowledge in identifying requirements communication problems within development teams, in improving the ability to clearly document requirements and that meets the needs of each profile of the company. Development team and improvement in requirements communication skills within software development teams, thereby obtaining an overview of what to improve in their artifacts, increasing the chances of success of their software projects, and improving the working skills teamwork of the participants, whether in the academic or professional context. We reiterate that the research will be done in loco, that is, in the institution/company where the participants study/work. If you accept to participate, you will be contributing to this doctoral research.

Post – Information Consent

I, _____, was informed about what the researcher wants to do and why he needs my collaboration, and I understood the explanation. Therefore, I agree to participate in the project, knowing that I will not win anything and that I can leave whenever I want. This document is issued in two copies, signed by both the researcher and me, leaving one copy with each one of us.

Place and date: _____

Participant

Researcher

Name: _____

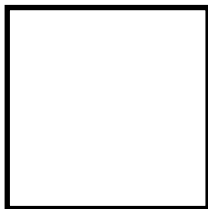
Name: Ana Carolina Oran Rocha

Signature: _____

Signature: _____

If the participant is unable to sign:

I, _____, the undersigned, confirm the reading of this term in full for the participant _____, who declared in my presence the full understanding and acceptance to participate in this research, who used their fingerprint (below)) to confirm participation.



Right thumb (if you do not sign)

Witness No. 1: _____

Witness No. 2: _____

Characterization Questionnaire

CHARACTERIZATION OF THE PARTICIPANT

Name: _____

Dear,

The form below will be used to understand your degree of experience in software development and requirements specification. The information collected will be treated confidentially. (you can check more than one option)

Experience with Software Development

Check the items related to the roles in which you worked in the Industry:

- I have no experience with Software Development in the industry.
- I have experience as a Requirements Engineer / Designer / Requirements Analyst. Time experience: __
- I have experience as a Developer / Programmer in the industry. Time experience: __
- I have experience as a Designer. Time experience: __
- I have experience as a test engineer/tester. Time experience: __
- I have experience as a Project Manager / Scrum Master / Project Leader. Time experience: __
- Others: _____

Knowledge of requirements specification with user stories

Check the items below that best apply to your answer regarding the degree of your prior knowledge of user stories.

- I do not have any previous knowledge on specifying requirements with user stories other than this discipline.
- I have already used requirements specification with user stories in academic works beyond this discipline.
- I have already used requirements specification with user stories in the industry.

Final Evaluation Questionnaire based on TAM

Name: _____

Opinion questionnaire on the use of TAX and TAI technologies to improve requirements communication by specifying requirements with user stories/user case.

TAX	Strongly disagree	Widely disagree	Partially disagree	Neutral	Partially agree	Widely agree	Strongly agree
Q1. The TAX questions are easy to understand	()	()	()	()	()	()	()
Please explain your answer.							
Q2. The TAX questions are useful for detecting problems in user stories.	()	()	()	()	()	()	()
Please explain your answer.							
What is your general perception about TAX? Would you use TAX again? On what occasion? Please be as sincere as possible.							

TAI	Strongly disagree	Widely disagree	Partially disagree	Neutral	Partially agree	Widely agree	Strongly agree
Q3. The TAI improvement suggestions are easy to understand.	()	()	()	()	()	()	()
Please explain your answer.							
Q4. The TAI improvement suggestions are useful for solving problems in user stories.	()	()	()	()	()	()	()
Please explain your answer.							
What is your general perception about TAI? Would you use TAI again? On what occasion? Please be as sincere as possible.							

Do you have any suggestions for improvement for TAX and TAI?

FIRST DSR CYCLE (1st experimental study) - scenarios and requirements specifications

In the first cycle, the artifacts used were: a) textual description of two systems in the user story template with similar levels of complexity, evaluated by the researchers (App RH Mobi and NetBarco app); and b) TAX_US_Dev and TAI_US_Dev - ReComP for user stories and the role of developers (v1).

a) App RH Mobi

System description:

The RH Mobi App aims to provide its users with a mobile application that allows them to view the job opportunities maintained by an HR consulting company. Besides, users will be able to view job openings and be able to apply for jobs according to their interests. When applying, the user can also attach his resume so that the consulting company can analyze it. The application will provide an option that will allow users to register to follow the curriculum analysis process.

Web System

For job vacancies, management, tips, courses, and lectures will be made available on a web system. The purpose of this web system is for the HR consulting firm's analysts to register job vacancies for companies and analyze the resumes sent by the application.

Related requirement: Manage Job Vacancies (web)

Use Story: US001 - Maintain Vacancies

As an HR Analyst

I want to register, consult and cancel a vacancy

So that registered vacancies can be made available to the RH Mobi application

Acceptance Criteria

To make an appointment:

Option in which the user informs the search filters (Job name and job status) to consult one or more registered jobs. If there are no vacancies registered for the informed filters, the system presents a message "Vacancies not found for the informed filters".

The situation can be: open, unavailable, and canceled.

According to the data filled in the filter, the system should present the list of available vacancies, with the information of Vacancy name, company, situation, number of resumes sent, and the On / Off and cancel options.

On / Off - Option where the user will be able to make the vacancy registration information available to the RH Mobi application.

To register:

Option where the user can select to register a new vacancy. The system presents a screen with the fields to be filled (Name of the job vacancy, type of contract, required experience, requirements for the vacancy, function/position, deadline for receipt of resumes, and company offering the vacancy).

The user must fill in all mandatory fields and click on the "Save" option. If the user does not enter one or more mandatory fields, the system must inform on the screen that these fields are mandatory.

To cancel:

Option where the user can cancel a registered vacancy. When the user cancels a vacancy, the vacancy status is automatically changed to “Canceled”. In this case, vacancies with the status of canceled are not available for the RH Mobi application.

b) NetBarco app

System description: The NetBarco app is a system designed to run on an android platform that allows sellers, authorized by boats, to sell river tickets to passengers who want to travel from one municipality to another. The NetBarco app has two databases, the local one stored on the smartphone itself and the web located on one of our servers hosted in the cloud.

Requirement: Maintain boat tickets

User story: US-073 - Sale of boat ticket for accommodation of type REDE

As a salesperson

I want to sell tickets for boat tickets for accommodation of the type

So that you can sell boat ticket tickets to passengers who want to travel from one municipality to another.

Acceptance Criteria

To carry out the Sale:

Step 1: Choice of boat + departure date:

To find the best available boat option, the seller fills out a filter form, selecting the city of origin, destination city, and departure period of the boat (consisting of start date and end date) and clicks ‘Search’.

According to the data filled in the filter, the system must present the list of available boats, ordered by departure date. The information to be presented in this list are: name of the boat, ticket price, and departure date of each boat., As shown below:

BOAT 1 (R \$ 100.00)

[4/22] [4/28] [5/1]

BOAT 2 (R \$ 95.00)

[4/23]

By clicking on one of the departure dates, the seller selects which boat + departure date he wishes to register/issue the ticket.

Step 2: Add passengers:

From the choice of boat + departure date, the system presents the passenger registration screen with the ‘Add Passenger’ button. When clicking on the button, the system displays the passenger editing form, and the seller records the passenger data, such as name, telephone number, nationality, gender, identification document number, date of birth, and clicks ‘Save’.

The seller can add as many passengers as he wants. For each new passenger, the system must show the total to be paid according to the following equation: Total = No. of Passengers * Value of the Network Type Accommodation Ticket.

The seller may also exclude passengers. When clicking on a passenger, the system should present the option ‘Delete’. By choosing ‘Delete’ the system removes the passenger from the passenger list.

Step 3: Ticket Summary:

The system displays the ticket summary of the ticket containing: number of passengers + total payment. The seller must click on the ‘Save’ button, and the system sends the ticket to the boat owner to control the number of tickets sold.

c) ReComP_US_Dev - 1 FIRST DSR CYCLE (1st experimental study)

- TAX_US_Developer

Artifact: <i>User story</i> – US	TAX_US	Role: Developer
----------------------------------	--------	-----------------

Name: _____

The TAX_US_Dev technology was developed to assist in the evaluation of the experience of the members of the development team about the use of user stories as a means of communicating requirements in a software development project. Please answer the questions based on your experience using the document with the user story and acceptance criteria you received to construct the prototypes.

1 - As for the user stories used for the development of the activity.

Questions	Yes	No	In some cases
TX1. Do you have difficulty identifying which customer requirement the user story is describing?			
TX1.1. If it is possible to identify the customer's requirement in the description of the user story, how was it specified?			
TX2. When there is a dependency between user stories, is it easy to identify it in the description?			
TX2.1. If it is possible to identify user stories' dependencies in the description of the user story, how were they specified?			
TX3. When there is a need for initial condition information before the user story is executed, is it described in the user story?			
TX3.1. If it is possible to identify the initial conditions (pre-condition) for the user story's execution, how were they specified?			
TX4. Do you have difficulty identifying the role / who is responsible for executing the functionality described in the user story?			
TX4.1. If it is possible to identify the role or responsible for executing the functionality of the user story, how was it specified?			
TX5. In the description of the user story, do you find it difficult to identify its purpose?			
TX5.1. If it is possible to identify the purpose of the user story, how was it specified?			
TX6. Do you have difficulty identifying the reason for the development of the functionality described in the user story?			
TX6.1. If it is possible to identify the reason for the development of the user story functionality, how was it specified?			
TX7. Do you have difficulty identifying alternative flows (choices that the user will be able to make when executing a feature) in the user story's specifications?			

Questions	Yes	No	In some cases
TX7.1. If it is possible to identify the alternative flows of the user story, how were they specified?			
TX8. Do you have difficulty identifying error handling or problem-solving flows that impede the flow of the user story?			
TX8.1. If it is possible to identify the user story error handling flows, how were they specified?			
TX9. In the user story description, if it needs to be developed with multiple screens, do you feel the need for information on how to go from one screen to another (navigation)?			
TX9.1. If it is possible to identify the navigation information in the user story, how was it specified?			
TX10. Do you feel the need for screen layout information (button names, field names, etc ...) in the user story description?			
TX10.1. If it is possible to identify the screen layout information in the user story, how were they specified?			
TX11. Can you identify the business rules (restrictions/premises) necessary for the user story's operation, in your description?			
TX11.1. If it is possible to identify the business rules in the user story, how were they specified?			
TX12. Do you feel the need for message information that must be presented to the user in the user story's specification?			
TX12.1. If it is possible to identify the message information in the user story, how was it specified?			
TX13. Do you feel the need for non-functional requirements information in the description of the user story?			
TX13.1. If it is possible to identify the non-functional requirements of the user story, how were they specified?			

2 - As for the information needs of the user stories for the development of your activity.

Check items	No	Yes	In some cases
TX14. Is the information presented in the user story sufficient for the development of your activities?			
TX14.1. What information do you need to develop your activities that is not described in this type of specification?			
TX15. Does the user story contain irrelevant information?			
TX15.1. What information in the user story do you consider irrelevant to the development of your activities?			
TX16. Does the user story present information with ambiguity?			
TX16.1. What information in the user story do you ambiguously consider?			

- **TAI_US_Developer**

Artifact: <i>User story</i> – US	TAI_US	Role: Developer
----------------------------------	--------	-----------------

The TAI_US_Dev technology was developed to help improve the artifacts, proposing patterns of solutions to the problems in the artifacts used to communicate requirements. All problems identified with TAX_US have a corresponding improvement suggestion in TAI_US. For example, the TX1 problem can be solved with the TI1 improvement.

Problem	Improvement suggestion to USER STORY
<p>TI1. I cannot identify which customer requirement the user story is related.</p>	<p>Suggestion: Create a field to identify the requirement related to the user story.</p> <p>Example:</p> <div style="border: 1px solid black; padding: 5px;"> <p>Requirement: Place order Related user story: Register products Precondition: be a reseller with active status As a reseller of Amora products I want to add products to my order So you can buy Amora products to resell in my store.</p> </div>
<p>TI2. It has related user stories, but I don't know what they are.</p>	<p>Suggestion: Create a field to identify related user stories and create traceability between them.</p> <p>Example:</p> <div style="border: 1px solid black; padding: 5px;"> <p>Requirement: Place order Related user story: Register products Precondition: be a reseller with active status As a reseller of Amora products I want to add products to my order So you can buy Amora products to resell in my store.</p> </div>
<p>TI3. The user story needs a previous condition to be executed, but I do not know what it is.</p>	<p>Suggestion: Create a precondition field to execute the user story.</p> <p>Example:</p> <div style="border: 1px solid black; padding: 5px;"> <p>Requirement: Place order Related user story: Register products Precondition: be a reseller with active status As a reseller of Amora products I want to add products to my order So you can buy Amora products to resell in my store</p> </div>
<p>TI4. I cannot identify the role / who is responsible for executing the functionality described in the user story.</p>	<p>Suggestion: Use the “How” field to identify the role that will perform the user story functionality.</p> <p>Example:</p> <div style="border: 1px solid black; padding: 5px;"> <p>Requirement: Place order Related user story: Register products Precondition: be a reseller with active status As a reseller of Amora products I want to add products to my order So you can buy Amora products to resell in my store.</p> </div>

Problem	Improvement suggestion to USER STORY
<p>T15. I cannot identify the purpose of developing the user story.</p>	<p>Suggestion: Use the “I want” field to identify the purpose of developing the functionality described in the user story.</p> <p>Example:</p> <div style="border: 1px solid black; padding: 5px;"> <p>Requirement: Place order Related user story: Register products Precondition: be a reseller with active status As a reseller of Amora products I want to add products to my order So you can buy Amora products to resell in my store.</p> </div>
<p>T16. I cannot identify the reason for the development of the user story.</p>	<p>Suggestion: Use the “For what” field to identify the reason for the development of the functionality described in the user story.</p> <p>Example:</p> <div style="border: 1px solid black; padding: 5px;"> <p>Requirement: Place order Related user story: Register products Precondition: be a reseller with active status As a reseller of Amora products I want to add products to my order So you can buy Amora products to resell in my store.</p> </div>
<p>T17. I cannot identify which alternative flows (choices the user can make when executing a feature) in the user story.</p>	<p>Suggestion: Create alternative scenarios to the one described in the user story, to describe alternative paths (choices that the user can make in the execution of a functionality) for the users that must be developed.</p> <p>Example:</p> <div style="border: 1px solid black; padding: 5px;"> <p>Requirement: Place order Related user story: Register products Precondition: be a reseller with active status As a reseller of Amora products I want to add products to my order So you can buy Amora products to resell in my store.</p> <p>Alternative scenarios AS1 - If the user cancels the operation, the reason for the cancellation must be saved in the system and the message MSG1 must be displayed. AS2 - If the user wishes to remove a product from the order, he must select the product and activate the option to delete it.</p> </div>
<p>T18. I cannot identify which error handling flows or how to resolve situations that prevent the flow of the user story.</p>	<p>Suggestion: Create exception scenarios to that described in the user story to describe ways to solve any problems that may occur in the execution of the user story.</p> <p>Example:</p> <div style="border: 1px solid black; padding: 5px;"> <p>.... As a product reseller I want to add products to my order. So you can buy Amora products to resell in my store</p> <p>Exception scenarios ES1 - If the quantity of products ordered exceeds the quantity of stock, the system displays the message MSG2</p> </div>

Problem	Improvement suggestion to USER STORY
<p>TI9. The user story needs several screens to be fully developed, but I do not know how to go from one screen to another.</p>	<p>Suggestion: Create a field to identify the navigation between the user story scenarios, or use prototypes to present the navigations.</p> <p>Example:</p> <div style="border: 1px solid black; padding: 5px;"> <p>Requirement: Place order Related user story: Register products Precondition: be a reseller with active status As a reseller of Amora products I want to add products to my order So you can buy Amora products to resell in my store</p> <p>Navigation: NAV1 - When saving the order, the system displays the user story screen US- View order summary.</p> </div>
<p>TI10. I do not know what it's like to develop the user story screen.</p>	<p>Suggestion: Create a field to identify elements that should compose the screen of the user story.</p> <p>Example:</p> <div style="border: 1px solid black; padding: 5px;"> <p>Requirement: Place order Related user story: Register products Precondition: be a reseller with active status As a reseller of Amora products I want to add products to my order So you can buy Amora products to resell in my store</p> <p>Order fields: Place order button in the main menu Form: Product (enabled - field for selection) Order quantity (enabled - numeric field) Unit value (disabled - information field) Total value per product (disabled - information field) Total order amount (disabled - information field) Option to exclude the product from the order list Save Order button Cancel button</p> </div>
<p>TI11. I cannot identify the business rules (restrictions/premises) necessary for the operation of the user story.</p>	<p>Suggestion: Create a field to identify the business rules that must be developed in the user story.</p> <p>Example:</p> <div style="border: 1px solid black; padding: 5px;"> <p>.... As a product reseller I want to add products to my order. So you can buy Amora products to resell in my store</p> <p>Exception scenarios ES1 - If the quantity of products ordered exceeds the quantity of stock, the system displays the message MSG2(RN1)</p> <p>Business rules: BR1 - The product order quantity cannot exceed 100 units.</p> </div>

Problem	Improvement suggestion to USER STORY
<p>TI12. I do not know what descriptions of the messages should be presented to the user.</p>	<p>Suggestion: Create a field to identify the messages that must be developed in the user story.</p> <p>Example:</p> <div style="border: 1px solid black; padding: 5px;"> <p>Requirement: Place order Related user story: Register products Precondition: be a reseller with active status As a reseller of Amora products I want to add products to my order So you can buy Amora products to resell in my store.</p> </div> <p>Exception scenarios: ES1 - If the quantity of products ordered exceeds the quantity of stock, the system displays the message MSG2 (RN1).</p> <p>Messages: MSG1 - Order canceled successfully. MSG2 - The quantity of products allowed per order is 100 units. You have exceeded the quantity! MSG3 - Product removed from the order.</p>
<p>TI13. I cannot identify the non-functional requirements listed in the user story description.</p>	<p>Suggestion: Create a field to identify the non-functional requirement (s) related to the user story.</p> <p>Example:</p> <div style="border: 1px solid black; padding: 5px;"> <p>Requirement: Place order Non-functional requirement: RNF001 Related user story: Register products Precondition: be a reseller with active status As a reseller of Amora products I want to add products to my order So you can buy Amora products to resell in my store</p> </div>

Example of a complete User story:

<p>Requirement: Place order Non-functional requirement: RNF001 Related user story: Register products. Precondition: be a reseller with active status. As a reseller of Amora products I want to add products to my order So you can buy Amora products to resell in my store</p> <p>Alternative scenarios AS1 - If the user cancels the operation, the reason for the cancellation must be saved in the system and the message MSG1 must be displayed. AS2 - If the user wishes to remove a product from the order, he must select the product and activate the option to delete and the system presents the MSG3.</p> <p>Exception scenarios ES1 - If the quantity of products ordered exceeds the quantity of stock, the system displays the message MSG2 (BR1).</p> <p>Business rules BR1 - The product order quantity cannot exceed 100 units.</p>
--

Navigation:

NAV1 - When saving the order, the system displays the user story screen US- View order summary.

Order fields:

Place order button in the main menu

Form:

- Product (enabled - field for selection)

- Order quantity (enabled - numeric field)

- Unit value (disabled - information field)

- Total value per product (disabled - information field)

- Total order amount (disabled - information field)

- Option to exclude the product from the order list

Save Order button

Cancel button

Messages:

MSG1 - Order canceled successfully.

MSG2 - The quantity of products allowed per order is 100 units. You have exceeded the quantity!

MSG3 - Product removed from order.

SECOND DSR CYCLE (2nd experimental study) - scenario and specification of requirement

In the second cycle, the artifacts used were: a) Problem scenario, a textual description of a use case; b) Prototype of the use case; and c) TAX_UC_Test and TAI_UC_Test - ReComP for specification with use case and testers role (v2).

a) Use case

System description: “The whole process of the company's legal documentation control is carried out using a spreadsheet in which information is updated manually. This document management model can result in potential risks, such as the expiration of some important tax documents for the company's compliance with tax authorities. Given this, the software will be responsible for serving the sectors that need document validity control. It will allow real-time monitoring of the company's documents to avoid them from running out of their validity and cause expenses to the company (fines and stoppage of activities)”.

System use cases:

UC001 - Configure Document

UC002 - Generate report

UC003 - View calendar / Graph

UC004 - Display document detail

UC005 - Regularize document

UC006 - Maintain Department

UC007 - Maintain Document

UC008 - Issue Alert

UC009 - Evaluate document registration

UC010 - Associate Document

Use Case ID:	UC01
Use case name:	Configure Document
Description:	This use case is executed when the user or administrator wants to configure a document.
Requirements:	<ul style="list-style-type: none"> FR004: The system should allow configuring of a document with expiration information and advance warning date.
Actors:	<ul style="list-style-type: none"> User and Administrator.
Pre-condition:	<ul style="list-style-type: none"> The user or administrator must be registered and authenticated in the system.
Main use case flow:	
<p>MF1. The User / Administrator wants to configure a document.</p> <p>MF1.1. The User / Administrator clicks the “Configure Document” button.</p> <p>MF1.2. The system shows the "Document Configuration" screen.</p> <p>MF1.3. The User / Administrator fills in the name of the document to be associated [BR1] [AF3].</p> <p>MF1.4. The User / Administrator selects the type of validity of the document "Fixed" [AF1] [BR2].</p> <p>MF1.5. The system enables the "Day", "Month" and "Expiration Type" fields and shows the "Expiration Date" field.</p> <p>MF1.6. The User / Administrator fills in the "Day" and "Month [EF1] fields.</p> <p>MF1.7. The User / Administrator selects the type of maturity of the document [BR3].</p> <p>MF1.8. The User / Administrator selects on how many days he / she wants the system to issue a document expiration alert [BR4].</p> <p>MF1.9. The User / Administrator selects the sector.</p> <p>MF1.10. The User / Administrator selects the responsible.</p> <p>MF1.11. The User / Administrator clicks on the “Add attachment” button.</p> <p>MF1.12. The User / Administrator selects the attachment to be added [AF3].</p> <p>MF1.13. The User / Administrator clicks the "Attach" button.</p> <p>MF1.14. The system reports that the document file has been attached [MSG3] [EF4].</p> <p>MF1.15. The User / Administrator fills in a note on this document [AF2].</p>	

<p>MF1.16. The User / Administrator selects one or more bodies and places them on the list of associated bodies.</p> <p>MF1.17. The User / Administrator clicks on the “Confirm Configuration” button.</p> <p>MF1.18. The system validates the association of documents [EF3].</p> <p>MF1.19. The system shows a message stating that the documents have been linked [MSG6].</p> <p>MF2. The use case ends.</p>	
Use case alternative flows:	
<p>[AF1] The User / Administrator selects the type of validity of the document "Variable".</p> <p>AF1.1. The system enables the "Expiration date" field and disables the "Day", "Month" and "Expiration type" fields.</p> <p>AF1.2. The User / Administrator fills in the "Expiration date" field [EF1].</p> <p>AF1.2.8. Go to step MF1.8.</p> <p>[AF2] The User / Administrator does not wish to complete any comments on this document.</p> <p>AF2.1. Go to step MF1.16.</p> <p>[AF3] The User / Administrator clicks the “Cancel” button.</p> <p>AF3.1. The system closes the current screen.</p> <p>AF3.2. The use case ends.</p> <p>[AF4] The User / Administrator clicks on the “Edit Document” button.</p> <p>AF4.1. The system displays a screen with a "Insert a new document" field.</p> <p>AF4.2. The User / Administrator clicks on the “Add attachment” button.</p> <p>AF4.3. The User / Administrator selects the document to be updated [AF3].</p> <p>AF4.4. The User / Administrator clicks the "Attach" button.</p> <p>AF4.5. The system updates the document list showing that it has been updated [EF4].</p> <p>AF4.6. The system displays a message that the document has been attached [MSG3].</p> <p>AF4.7. Go to step MF1.15.</p> <p>[AF5] The User / Administrator clicks the "Delete document" button.</p> <p>AF5.1. The system asks for confirmation of the deletion [MSG7].</p> <p>AF5.2. The Administrator clicks the “Yes” button [AF3].</p> <p>AF5.3. The system deletes the document and updates the document list.</p> <p>AF5.4. The system displays a message that the document has been deleted [MSG8].</p> <p>AF5.5. Go to step MF1.15.</p>	
Use Case exception flows	
<p>EF1. The system checks that the "Day" and / or "Month" fields are invalid.</p> <p>EF1.1. The system displays an alert [MSG1].</p> <p>EF1.2. Go to step MF1.6.</p> <p>EF2. The system checks that the "Expiration date" field is invalid.</p> <p>EF2.1. The system displays an alert [MSG2].</p> <p>EF2.2. Go to step FA1.2.</p> <p>EF3. The system checks that one or more mandatory fields have not been completed.</p> <p>EF3.1. The system displays an alert [MSG4].</p> <p>EF3.2. Go to step MF1.2.</p> <p>EF4. The system verifies that the document file cannot be attached.</p> <p>EF4.1. The system displays an alert [MSG5].</p> <p>EF4.2. Go to step MF1.11 if it came from the MF. Go to step AF4.3 if you came from AF.</p>	
Business rules:	<p>BR1. The "Document Name" field has an auto complete informing the suggestions of documents already registered.</p> <p>BR2. A document can have Fixed or Variable validity.</p> <p>BR3. A document can have Monthly, Bimonthly, Quarterly, Semi-annual and Annual expiration.</p> <p>BR4. An alert can be configured by the User / Administrator to be issued in a specified number of days.</p>
Messages:	<p>MSG1. “The Day and Month fields are invalid. Fill in the Day and Month with valid values.”</p> <p>MSG2. “The Due Date field is invalid. Fill in this field with a valid date.”</p> <p>MSG3. "The document file has been successfully attached."</p> <p>MSG4. “Filling in the field (s) <Name of the field (s)> is / are mandatory. Fill in to proceed.”</p>

- MSG5.** "The document file cannot be attached. Only file in pdf format. Try again."
- MSG6.** "The document has been successfully configured."
- MSG7.** "Are you sure you want to delete this document?"
- MSG8.** "Document deleted successfully."

b) Prototype

Configure Document

Document Name:

Validity Type:

Expiration Type:

Day: Month: Expiration Date:

Advance Alert:

Sector:

Responsible:

Department List:

Associated Department (s) sDt:

Document Attachment:

PDF file only

Document name	Actions
Document 1.pdf	<input type="button" value="edit"/> <input type="button" value="delete"/>

Annotations:

- The Document Name field will have an autocomplete informing suggestions of documents already registered
- When the Validity Type selected is Fixed, the fields: Day, Month and Expiration Type will be enabled. And the Due Date field is disabled.
- When the Validity Type selected is Variable, the Due Date field is enabled. And the Day, Month and Expiration Type fields are disabled.
- The format of the month field is in number 01 - January, 02 - February

c) ReComp_UC_Test - SECOND DSR CYCLE (2nd experimental study)

- TAX_UC_Tester**

TAX_UC
Artifact: Use Case – UC
Role: Tester

Name: _____

The TAX_UC_Test technology was developed to help evaluate the experience of members of the development team about the use of use cases as a means of communicating requirements in software development projects. Please answer the questions based on your experience using the use case you received for the construction of the test cases.

1 - As for the use case used for the development of your activity.

Questions	Yes	No	In some cases	I do not need this information
Regarding the content of the use case for creating the system test cases.				
TX1. In the use case description, can you identify the purpose of the use case for creating the test cases?				
TX2. In the use case description, can you identify dependencies with other use cases for creating test cases?				
TX3. Can you identify the role/who is responsible for executing the described use case functionality for creating the test cases?				
TX4. Can you identify the entry conditions (initial conditions before the use case is executed - precondition) in the use case description for creating the test cases?				
TX5. Can you identify the main scenario between actor and system in the use case description for creating test cases?				
TX6. Can you identify the alternative scenarios (choices that the user can make when executing a feature - Alternative flow) in the description of the use case for creating the test cases?				
TX7. Can you identify error handling or problem-solving scenarios (Exception flow) that prevent the flow from progressing in the use case description for creating test cases?				
TX8. Can you identify the business rules (restrictions / assumptions) in the use case description for creating the test cases?				
TX9. Can you identify message information that should be presented to the user in the use case description for creating test cases?				
TX10. Can you identify end conditions after the use case is executed (post-condition in the use case description for creating the test cases?				
TX11. Can you identify the obligation to fill in the fields on the screen in the description of the use case or in another artifact for the creation of the test cases?				
Regarding the presentation (Interface layout) for creating the system test cases.				
TX12. Can you identify screen layout information (button names, field names, etc ...) in the use case description or in another artifact for creating test cases?				

Questions	Yes	No	In some cases	I do not need this information
TX13. You can identify the types of screen layout fields ("combo box", "list", "checkbox", "table", etc.) in the use case description or in another artifact for creating test cases ?				
TX14. Can you identify the size of the screen fields in the use case description or other artifact for creating test cases?				
TX15. Can you identify the pattern that should be filled in the fields of the screen (mask) in the description of the use case or in another artifact for the creation of the test cases?				
TX16. Can you identify when a field is enabled or disabled in the use case description or other artifact for creating test cases?				
Regarding navigation for the creation of system test cases.				
TX17. Can you identify the navigation rules between screens in the use case description or in another artifact for creating test cases?				

2 - As for the information needs of the use cases for the development of its activity.

Check items	Yes	No	In some cases
TX18. Is the information presented in the use case sufficient for the development of your activities?			
TX18.1. If not, describe what information was missing.			
TX19. Does the use case contain irrelevant information?			
TX19.1. If so, describe what information is irrelevant.			
TX20. Does the use case contain information ambiguously?			
TX20.1. If yes, please describe what information is ambiguous.			

- **TAI_UC_Tester**

Artifact: Use Case – UC	TAI_UC	Role: Tester
-------------------------	--------	--------------

The TAI_UC_Tester technology was developed to assist the improvement of the artifacts, proposing patterns of solutions to the problems in the artifacts used to communicate requirements. All problems identified with TAX_UC have a corresponding improvement suggestion in TAI_UC. For example, the TX1 problem can be solved with the T11 improvement. If there was no problem identified in TAX when creating the prototype, then you don't need to make all the improvements suggested in TAI.

Problem	Improvement suggestion to Use Case	
Corresponding to TX1 T11. I cannot identify the purpose of the specified use case.	Suggestion: Create a field to describe the purpose of the use case briefly.	
	Example:	
	UC Identification	UC005 - Request Vehicle Scheduling
	Related use case	...
	Description:	allow the user to request a vehicle scheduling informing the destination and passengers.
...	...	

Problem	Improvement suggestion to Use Case								
<p>Corresponding to TX2 TI2. There are related use cases, but I don't know what they are.</p>	<p>Suggestion: Create a field to identify related use cases and create traceability between them.</p> <p>Example:</p> <table border="1"> <tr> <td>UC Identification</td> <td>UC005 - Request Vehicle Scheduling</td> </tr> <tr> <td>Related use case</td> <td>UC001 - Vehicle registration UC006 - Cancel schedule</td> </tr> <tr> <td>...</td> <td>...</td> </tr> </table>	UC Identification	UC005 - Request Vehicle Scheduling	Related use case	UC001 - Vehicle registration UC006 - Cancel schedule		
UC Identification	UC005 - Request Vehicle Scheduling								
Related use case	UC001 - Vehicle registration UC006 - Cancel schedule								
...	...								
<p>Corresponding to TX3 TI3. I cannot identify the role / who is responsible for performing the functionality described in the use case.</p>	<p>Suggestion: Create an actors field to identify the role that will perform the use case's functionality.</p> <p>Example:</p> <table border="1"> <tr> <td>Related use case</td> <td>...</td> </tr> <tr> <td>Description:</td> <td>...</td> </tr> <tr> <td>Actor (s):</td> <td>Secretary</td> </tr> <tr> <td>...</td> <td>...</td> </tr> </table>	Related use case	...	Description:	...	Actor (s):	Secretary
Related use case	...								
Description:	...								
Actor (s):	Secretary								
...	...								
<p>Corresponding to TX4 TI4. The use case needs an earlier condition to be executed, but I don't know what it is.</p>	<p>Suggestion: Create a precondition field to execute the use case.</p> <p>Example:</p> <table border="1"> <tr> <td>Description:</td> <td>...</td> </tr> <tr> <td>Actor (s):</td> <td>...</td> </tr> <tr> <td>Precondition</td> <td>There is a secretary profile.</td> </tr> <tr> <td>....</td> <td>....</td> </tr> </table>	Description:	...	Actor (s):	...	Precondition	There is a secretary profile.
Description:	...								
Actor (s):	...								
Precondition	There is a secretary profile.								
....								
<p>Corresponding to TX5 TI5. I cannot identify the main interaction between the actor and the system in the use case description.</p>	<p>Suggestion: Create a main flow field to describe the steps of the use case you should perform in normal situations, that is, without considering any errors and alternatives.</p> <p>Example:</p> <table border="1"> <tr> <td>Precondition</td> <td>...</td> </tr> <tr> <td>Main Flow</td> <td> <ol style="list-style-type: none"> 1. The system displays the main application menu; 2. The user selects the “Scheduling” option; 3. The system presents a screen with search filters, a list of schedules and the options of “Consult”, “New”, “Cancel Schedule” and “Edit” [BR1, AF1, AF2, SI1]; 4. The user selects the “New” option; 5. The system presents a screen with a form to fill in the scheduling information with the options “Save” and “Cancel” [AF4, SI2]; 6. The user fills in the fields and selects the option “Save” [EF1, EF2, BR2]; 7. The system saves the data and displays a message MSG001 [BR3]; </td> </tr> <tr> <td>Alternative flow</td> <td>...</td> </tr> </table>	Precondition	...	Main Flow	<ol style="list-style-type: none"> 1. The system displays the main application menu; 2. The user selects the “Scheduling” option; 3. The system presents a screen with search filters, a list of schedules and the options of “Consult”, “New”, “Cancel Schedule” and “Edit” [BR1, AF1, AF2, SI1]; 4. The user selects the “New” option; 5. The system presents a screen with a form to fill in the scheduling information with the options “Save” and “Cancel” [AF4, SI2]; 6. The user fills in the fields and selects the option “Save” [EF1, EF2, BR2]; 7. The system saves the data and displays a message MSG001 [BR3]; 	Alternative flow	...		
Precondition	...								
Main Flow	<ol style="list-style-type: none"> 1. The system displays the main application menu; 2. The user selects the “Scheduling” option; 3. The system presents a screen with search filters, a list of schedules and the options of “Consult”, “New”, “Cancel Schedule” and “Edit” [BR1, AF1, AF2, SI1]; 4. The user selects the “New” option; 5. The system presents a screen with a form to fill in the scheduling information with the options “Save” and “Cancel” [AF4, SI2]; 6. The user fills in the fields and selects the option “Save” [EF1, EF2, BR2]; 7. The system saves the data and displays a message MSG001 [BR3]; 								
Alternative flow	...								

Problem	Improvement suggestion to Use Case									
<p>Corresponding to TX6 TI6. I can't identify which alternative flows (choices the user will be able to make when executing a feature) of the use case.</p>	<p>Suggestion: Create a field of alternative flows to the one described in the use case, to describe alternative paths (choices that the user can make in the execution of a functionality) for the users that must be developed.</p> <p>Example:</p> <table border="1"> <tr> <td>Precondition</td> <td>...</td> </tr> <tr> <td>Main Flow</td> <td> 2. ... 3. The system presents a screen with search filters, a list of schedules and the options of "Consult", "New", "Cancel Schedule" and "Edit" [BR1, AF1, AG2, SI1]; 4. ... </td> </tr> <tr> <td>Alternative flow</td> <td> AF1 - Select Cancel Schedule option 1. The user selects an item from the list and the option "Cancel Schedule"; 2. The system extends the "Cancel Schedule" use case; </td> </tr> </table>		Precondition	...	Main Flow	2. ... 3. The system presents a screen with search filters, a list of schedules and the options of "Consult", "New", "Cancel Schedule" and "Edit" [BR1, AF1, AG2, SI1]; 4. ...	Alternative flow	AF1 - Select Cancel Schedule option 1. The user selects an item from the list and the option "Cancel Schedule"; 2. The system extends the "Cancel Schedule" use case;		
Precondition	...									
Main Flow	2. ... 3. The system presents a screen with search filters, a list of schedules and the options of "Consult", "New", "Cancel Schedule" and "Edit" [BR1, AF1, AG2, SI1]; 4. ...									
Alternative flow	AF1 - Select Cancel Schedule option 1. The user selects an item from the list and the option "Cancel Schedule"; 2. The system extends the "Cancel Schedule" use case;									
<p>Corresponding to TX7 TI7. I can't identify which error handling flows or how to resolve situations that impede the flow of the use case.</p>	<p>Suggestion: Create a field of exception flows to that described in the use case, to describe ways to solve any problems that may occur in the execution of the use case.</p> <p>Example:</p> <table border="1"> <tr> <td>Precondition</td> <td>...</td> </tr> <tr> <td>Main Flow</td> <td> 4. ... 5. The user fills in the fields and selects the option "Save" [EF1, EF2, BR2]; 6. The system saves the data and displays a message MSG001 [BR3]; ... </td> </tr> <tr> <td>Alternative flows:</td> <td>...</td> </tr> <tr> <td>Exception flows:</td> <td> EF1 - Mandatory fields for scheduling 1. The system verifies that the mandatory fields in the schedule record have not been filled out and displays a message MSG002. </td> </tr> </table>		Precondition	...	Main Flow	4. ... 5. The user fills in the fields and selects the option "Save" [EF1, EF2, BR2]; 6. The system saves the data and displays a message MSG001 [BR3]; ...	Alternative flows:	...	Exception flows:	EF1 - Mandatory fields for scheduling 1. The system verifies that the mandatory fields in the schedule record have not been filled out and displays a message MSG002.
Precondition	...									
Main Flow	4. ... 5. The user fills in the fields and selects the option "Save" [EF1, EF2, BR2]; 6. The system saves the data and displays a message MSG001 [BR3]; ...									
Alternative flows:	...									
Exception flows:	EF1 - Mandatory fields for scheduling 1. The system verifies that the mandatory fields in the schedule record have not been filled out and displays a message MSG002.									
<p>Corresponding to TX8 TI8. I cannot identify the business rules (restrictions /premises) necessary for the operation of the use case</p>	<p>Suggestion: Create a field to identify the business rules that must be developed in the use case.</p> <p>Example:</p> <table border="1"> <tr> <td>Precondition</td> <td>...</td> </tr> <tr> <td>Main Flow</td> <td> 5 ... 6. The user fills in the fields and selects the option "Save" [EF1, EF2, BR2]; 7. The system saves the data and displays a message MSG001 [BR3]; </td> </tr> <tr> <td>Alternative flow</td> <td>....</td> </tr> <tr> <td>Business Rules</td> <td> BR1 - The list must be presented in order of the date of the most recent entries for the oldest; BR2 - The scheduling of the same vehicle cannot be made for the same date and time; </td> </tr> </table>		Precondition	...	Main Flow	5 ... 6. The user fills in the fields and selects the option "Save" [EF1, EF2, BR2]; 7. The system saves the data and displays a message MSG001 [BR3];	Alternative flow	Business Rules	BR1 - The list must be presented in order of the date of the most recent entries for the oldest; BR2 - The scheduling of the same vehicle cannot be made for the same date and time;
Precondition	...									
Main Flow	5 ... 6. The user fills in the fields and selects the option "Save" [EF1, EF2, BR2]; 7. The system saves the data and displays a message MSG001 [BR3];									
Alternative flow									
Business Rules	BR1 - The list must be presented in order of the date of the most recent entries for the oldest; BR2 - The scheduling of the same vehicle cannot be made for the same date and time;									
<p>Corresponding to TX9 TI9. I don't know what descriptions of the messages should be presented to the user.</p>	<p>Suggestion: Create a field to identify the messages that must be developed in the use case.</p> <p>Example:</p> <table border="1"> <tr> <td>Precondition</td> <td>...</td> </tr> <tr> <td>Main Flow</td> <td> 5. ... 6. The user fills in the fields and selects the option "Save" [EF1, EF2, BR2]; 7. The system saves the data and displays a message MSG001 [BR3]; </td> </tr> </table>		Precondition	...	Main Flow	5. ... 6. The user fills in the fields and selects the option "Save" [EF1, EF2, BR2]; 7. The system saves the data and displays a message MSG001 [BR3];				
Precondition	...									
Main Flow	5. ... 6. The user fills in the fields and selects the option "Save" [EF1, EF2, BR2]; 7. The system saves the data and displays a message MSG001 [BR3];									

Problem	Improvement suggestion to Use Case													
	Alternative flow												
	Exception flows:	EF1 - Mandatory fields for scheduling 1. The system verifies that the mandatory fields in the schedule record have not been filled out and displays a message MSG002 .												
	Business rules												
	Messages	MSG001: "Operation successful!" MSG002: "Mandatory fields must be filled".												
Corresponding to TX10 TI10. The use case needs final conditions after it is executed, but I don't know which one it is.	Suggestion: Create a post-condition field for the use case execution. Example: <table border="1"> <tr> <td>Precondition</td> <td>...</td> </tr> <tr> <td>Main Flow</td> <td> 1. The system displays the main application menu; 2. The user selects the "Scheduling" option; 3. The system presents a screen (SI1) with search filters, a list of schedules and the options of "Consult", "New", "Cancel Schedule" and "Edit" [BR1, AF1, AF2]; 4. ... </td> </tr> <tr> <td>Alternative flow</td> <td>....</td> </tr> <tr> <td>Exception flows:</td> <td> EF1 - Mandatory fields for scheduling 1. The system verifies that the mandatory fields in the schedule record have not been filled out and displays a message MSG002. </td> </tr> <tr> <td>Business rules</td> <td>....</td> </tr> <tr> <td>Post-condition</td> <td> Vehicle scheduling successfully performed and date and time allocated in the system. </td> </tr> </table>		Precondition	...	Main Flow	1. The system displays the main application menu; 2. The user selects the "Scheduling" option; 3. The system presents a screen (SI1) with search filters, a list of schedules and the options of "Consult", "New", "Cancel Schedule" and "Edit" [BR1, AF1, AF2]; 4. ...	Alternative flow	Exception flows:	EF1 - Mandatory fields for scheduling 1. The system verifies that the mandatory fields in the schedule record have not been filled out and displays a message MSG002 .	Business rules	Post-condition	Vehicle scheduling successfully performed and date and time allocated in the system.
Precondition	...													
Main Flow	1. The system displays the main application menu; 2. The user selects the "Scheduling" option; 3. The system presents a screen (SI1) with search filters, a list of schedules and the options of "Consult", "New", "Cancel Schedule" and "Edit" [BR1, AF1, AF2]; 4. ...													
Alternative flow													
Exception flows:	EF1 - Mandatory fields for scheduling 1. The system verifies that the mandatory fields in the schedule record have not been filled out and displays a message MSG002 .													
Business rules													
Post-condition	Vehicle scheduling successfully performed and date and time allocated in the system.													
Corresponding to TX11 TI11. I don't know which fields on the use case screen are required .	Suggestion: Create an identifier in the use case or in another artifact to highlight which of the fields are required to be filled out. Example: <table border="1"> <tr> <td>Precondition</td> <td>...</td> </tr> <tr> <td>Main Flow</td> <td> 4. ... 5. The system presents a screen with form (SI2) to fill in the scheduling information with the options "Save" and "Cancel" [AF4, SI1]; 6. The user fills in the fields and selects the option "Save" [EF1, EF2, BR2]; 7. The system saves the data and displays a message MSG001 [BR3]; </td> </tr> <tr> <td>Alternative flow</td> <td>....</td> </tr> <tr> <td>Screen information</td> <td> SI2 - For vehicle scheduling, the following data is requested: Name of the employee requesting the reservation (list of employees - 15 characters) *, Name of passengers who will be in the vehicle (text box - 20 characters), Source and destination address (text box - 70 characters) *, Departure and return time (text box - 5 characters - hh: mm) *; </td> </tr> </table>		Precondition	...	Main Flow	4. ... 5. The system presents a screen with form (SI2) to fill in the scheduling information with the options "Save" and "Cancel" [AF4, SI1]; 6. The user fills in the fields and selects the option "Save" [EF1, EF2, BR2]; 7. The system saves the data and displays a message MSG001 [BR3];	Alternative flow	Screen information	SI2 - For vehicle scheduling, the following data is requested: Name of the employee requesting the reservation (list of employees - 15 characters) *, Name of passengers who will be in the vehicle (text box - 20 characters), Source and destination address (text box - 70 characters) *, Departure and return time (text box - 5 characters - hh: mm) *;				
Precondition	...													
Main Flow	4. ... 5. The system presents a screen with form (SI2) to fill in the scheduling information with the options "Save" and "Cancel" [AF4, SI1]; 6. The user fills in the fields and selects the option "Save" [EF1, EF2, BR2]; 7. The system saves the data and displays a message MSG001 [BR3];													
Alternative flow													
Screen information	SI2 - For vehicle scheduling, the following data is requested: Name of the employee requesting the reservation (list of employees - 15 characters) *, Name of passengers who will be in the vehicle (text box - 20 characters), Source and destination address (text box - 70 characters) *, Departure and return time (text box - 5 characters - hh: mm) *;													

Problem	Improvement suggestion to Use Case								
<p>Corresponding to TX12 TI12. I don't know what it's like to develop the use case screen.</p>	<p>Suggestion: Create a field in the use case or in another artifact to identify elements that should make up the screen of the use case.</p> <p>Example:</p> <table border="1"> <tr> <td>Precondition</td> <td>...</td> </tr> <tr> <td>Main Flow</td> <td> 1. The system displays the main application menu; 2. The user selects the “Scheduling” option; 3. The system presents a screen (SI1) with search filters, a list of schedules and the options of “Consult”, “New”, “Cancel Schedule” and “Edit” [BR1, AF1, AF2]; 4. ... </td> </tr> <tr> <td>Alternative flow</td> <td>....</td> </tr> <tr> <td>Screen information</td> <td> SI2 - For vehicle scheduling, the following data is requested: Name of the employee requesting the reservation, Name of passengers who will be in the vehicle, Source and destination address, Departure and return time; </td> </tr> </table>	Precondition	...	Main Flow	1. The system displays the main application menu; 2. The user selects the “Scheduling” option; 3. The system presents a screen (SI1) with search filters, a list of schedules and the options of “Consult”, “New”, “Cancel Schedule” and “Edit” [BR1, AF1, AF2]; 4. ...	Alternative flow	Screen information	SI2 - For vehicle scheduling, the following data is requested: Name of the employee requesting the reservation, Name of passengers who will be in the vehicle, Source and destination address, Departure and return time;
Precondition	...								
Main Flow	1. The system displays the main application menu; 2. The user selects the “Scheduling” option; 3. The system presents a screen (SI1) with search filters, a list of schedules and the options of “Consult”, “New”, “Cancel Schedule” and “Edit” [BR1, AF1, AF2]; 4. ...								
Alternative flow								
Screen information	SI2 - For vehicle scheduling, the following data is requested: Name of the employee requesting the reservation, Name of passengers who will be in the vehicle, Source and destination address, Departure and return time;								
<p>Corresponding to TX13 TI13. I don't know what type of fields the use case screen.</p>	<p>Suggestion: Create a field in the use case or in another artifact to identify which types of fields should make up the use case screen.</p> <p>Example:</p> <table border="1"> <tr> <td>Precondition</td> <td>...</td> </tr> <tr> <td>Main Flow</td> <td> 3. ... 4. The user selects the “New” option; 5. The system presents a screen with form (SI2) to fill in the scheduling information with the options “Save” and “Cancel” [AF4, SI1]; 6. ... </td> </tr> <tr> <td>Alternative flow</td> <td>....</td> </tr> <tr> <td>Screen information</td> <td> SI2 - For vehicle scheduling, the following data is requested: Name of the employee requesting the reservation (list of employees), Name of passengers who will be in the vehicle (text box), Source and destination address (text box), Departure and return time (text box); </td> </tr> </table>	Precondition	...	Main Flow	3. ... 4. The user selects the “New” option; 5. The system presents a screen with form (SI2) to fill in the scheduling information with the options “Save” and “Cancel” [AF4, SI1]; 6. ...	Alternative flow	Screen information	SI2 - For vehicle scheduling, the following data is requested: Name of the employee requesting the reservation (list of employees), Name of passengers who will be in the vehicle (text box), Source and destination address (text box), Departure and return time (text box);
Precondition	...								
Main Flow	3. ... 4. The user selects the “New” option; 5. The system presents a screen with form (SI2) to fill in the scheduling information with the options “Save” and “Cancel” [AF4, SI1]; 6. ...								
Alternative flow								
Screen information	SI2 - For vehicle scheduling, the following data is requested: Name of the employee requesting the reservation (list of employees), Name of passengers who will be in the vehicle (text box), Source and destination address (text box), Departure and return time (text box);								
<p>Corresponding to TX14 TI14. I don't know the size of the use case's screen fields.</p>	<p>Suggestion: Create a field in the use case or in another artifact to identify the size of the fields that should make up the screen of the use case.</p> <p>Example:</p> <table border="1"> <tr> <td>Precondition</td> <td>...</td> </tr> <tr> <td>Main Flow</td> <td> 4. ... 5. The system presents a screen with form (SI2) to fill in the scheduling information with the options “Save” and “Cancel” [AF4, SI1]; 6. The user fills in the fields and selects the option “Save” [EF1, EF2, BR2]; 7. The system saves the data and displays a message MSG001 [BR3]; </td> </tr> <tr> <td>Alternative flow</td> <td>....</td> </tr> <tr> <td>Screen information</td> <td> SI2 - For vehicle scheduling, the following data is requested: Name of the employee requesting the reservation (list of employees - 15 characters), </td> </tr> </table>	Precondition	...	Main Flow	4. ... 5. The system presents a screen with form (SI2) to fill in the scheduling information with the options “Save” and “Cancel” [AF4, SI1]; 6. The user fills in the fields and selects the option “Save” [EF1, EF2, BR2]; 7. The system saves the data and displays a message MSG001 [BR3];	Alternative flow	Screen information	SI2 - For vehicle scheduling, the following data is requested: Name of the employee requesting the reservation (list of employees - 15 characters),
Precondition	...								
Main Flow	4. ... 5. The system presents a screen with form (SI2) to fill in the scheduling information with the options “Save” and “Cancel” [AF4, SI1]; 6. The user fills in the fields and selects the option “Save” [EF1, EF2, BR2]; 7. The system saves the data and displays a message MSG001 [BR3];								
Alternative flow								
Screen information	SI2 - For vehicle scheduling, the following data is requested: Name of the employee requesting the reservation (list of employees - 15 characters),								

Problem	Improvement suggestion to Use Case									
	Name of passengers who will be in the vehicle (text box - 20 characters), Source and destination address (text box - 30 characters), Departure and return time (text box - 5 characters);									
Corresponding to TX15 TI15. I don't know what the pattern (mask) of the fields in the use case is	Suggestion: Create a field in the use case or in another artifact to identify the pattern (mask) of the fields that should make up the use case screen. Example: <table border="1"> <tr> <td>Precondition</td> <td>...</td> </tr> <tr> <td>Main Flow</td> <td> 4. ... 5. The system presents a screen with form (SI2) to fill in the scheduling information with the options "Save" and "Cancel" [AF4, SI1]; 6. The user fills in the fields and selects the option "Save" [EF1, EF2, BR2]; 7. The system saves the data and displays a message MSG001 [BR3]; </td> </tr> <tr> <td>Alternative flow</td> <td>....</td> </tr> <tr> <td>Screen information</td> <td> SI2 - For vehicle scheduling, the following data is requested: Name of the employee requesting the reservation (list of employees - 15 characters), Name of passengers who will be in the vehicle (text box - 20 characters), Source and destination address (text box - 30 characters), Departure and return time (text box - 5 characters - hh: mm); </td> </tr> </table>		Precondition	...	Main Flow	4. ... 5. The system presents a screen with form (SI2) to fill in the scheduling information with the options "Save" and "Cancel" [AF4, SI1]; 6. The user fills in the fields and selects the option "Save" [EF1, EF2, BR2]; 7. The system saves the data and displays a message MSG001 [BR3];	Alternative flow	Screen information	SI2 - For vehicle scheduling, the following data is requested: Name of the employee requesting the reservation (list of employees - 15 characters), Name of passengers who will be in the vehicle (text box - 20 characters), Source and destination address (text box - 30 characters), Departure and return time (text box - 5 characters - hh: mm);
Precondition	...									
Main Flow	4. ... 5. The system presents a screen with form (SI2) to fill in the scheduling information with the options "Save" and "Cancel" [AF4, SI1]; 6. The user fills in the fields and selects the option "Save" [EF1, EF2, BR2]; 7. The system saves the data and displays a message MSG001 [BR3];									
Alternative flow									
Screen information	SI2 - For vehicle scheduling, the following data is requested: Name of the employee requesting the reservation (list of employees - 15 characters), Name of passengers who will be in the vehicle (text box - 20 characters), Source and destination address (text box - 30 characters), Departure and return time (text box - 5 characters - hh: mm);									
Corresponding to TX16 TI16. I don't know which fields should be enabled or disabled on the use case screen.	Suggestion: Create a field in the use case or in another artifact to identify the enabled or disabled mode of the fields that should make up the use case screen. Example: <table border="1"> <tr> <td>Precondition</td> <td>...</td> </tr> <tr> <td>Main Flow</td> <td> 4. ... 5. The system presents a screen with form (SI2) to fill in the scheduling information with the options "Save" and "Cancel" [AF4, SI1]; 6. The user fills in the fields and selects the option "Save" [EF1, EF2, BR2]; 7. The system saves the data and displays a message MSG001 [BR3]; </td> </tr> <tr> <td>Alternative flow</td> <td>....</td> </tr> <tr> <td>Screen information</td> <td> SI2 - For vehicle scheduling, the following data are requested: Name of the employee requesting the reservation (list of employees - 15 characters - enabled), Name of passengers who will be in the vehicle (text box - 20 characters - enabled), Source and destination address (text box - 30 characters - enabled), Departure and return time (text box - 5 characters - hh: mm - enabled); </td> </tr> </table>		Precondition	...	Main Flow	4. ... 5. The system presents a screen with form (SI2) to fill in the scheduling information with the options "Save" and "Cancel" [AF4, SI1]; 6. The user fills in the fields and selects the option "Save" [EF1, EF2, BR2]; 7. The system saves the data and displays a message MSG001 [BR3];	Alternative flow	Screen information	SI2 - For vehicle scheduling, the following data are requested: Name of the employee requesting the reservation (list of employees - 15 characters - enabled), Name of passengers who will be in the vehicle (text box - 20 characters - enabled), Source and destination address (text box - 30 characters - enabled), Departure and return time (text box - 5 characters - hh: mm - enabled);
Precondition	...									
Main Flow	4. ... 5. The system presents a screen with form (SI2) to fill in the scheduling information with the options "Save" and "Cancel" [AF4, SI1]; 6. The user fills in the fields and selects the option "Save" [EF1, EF2, BR2]; 7. The system saves the data and displays a message MSG001 [BR3];									
Alternative flow									
Screen information	SI2 - For vehicle scheduling, the following data are requested: Name of the employee requesting the reservation (list of employees - 15 characters - enabled), Name of passengers who will be in the vehicle (text box - 20 characters - enabled), Source and destination address (text box - 30 characters - enabled), Departure and return time (text box - 5 characters - hh: mm - enabled);									
Corresponding to TX17 TI17. To be fully developed, the use case needs several screens , but I don't know how to go	Suggestion: Create a field in the use case or in another artifact to identify navigation between screens or dialogs in the flow of the use case. Example: <table border="1"> <tr> <td>Precondition</td> <td>...</td> </tr> </table>		Precondition	...						
Precondition	...									

Problem	Improvement suggestion to Use Case	
from one screen to another.	Main Flow	<ol style="list-style-type: none"> 1. ... 2. The system presents a screen with search filters, a list of schedules and the options of “Consult”, “New”, “Cancel Schedule” and “Edit” [BR1, AF1, AF2, SI1]; 3. The user selects the “New” option; 4. The system presents a screen with a form to fill in the scheduling information with the options “Save” and “Cancel” [AF4, SI2]; 5. ...

