

Appendices

Appendix A

Appendix Guide to the CoMeS-SPL

GUIDE TO THE COLLABORATIVE METHOD FOR SCOPING SOFTWARE PRODUCT LINES COMES-SPL

Software product line scoping is one of an essential and complex activities of SPL development, because it is an interdisciplinary activity with a high impact on the SPL success. SPL scoping defines belonging relationships to the SPL among domains, features, reusable assets and products as multi-set.

For instance, the scoping bounds the product line by defining those products belong to the line and which ones do not, it specifies the domain and raises the basis for the construction of the reusable assets.

The following sections present the tasks and sub-tasks of the method:

- Initial meeting
 - Assemble the profile of the line
 - Baptize the line
- Identify features

- Explore existing products
 - Propose features
 - Analyze features
 - Concert features
- Identify Products
- Identify functional domains
- Classify features in functional domains
- Tabulate products and features
- Validation product map
- Set metrics
- Quantify product map and functional domains
- Final meeting

For the description of each task, MFP extending HAMSTERS notation was used. the figure ?? shows the representation of an activity in the MFP, using HAMSTERS elements. And the figure ?? presents the images used to represent the steps that make up a collaborative task, and these correspond to the steps defined in the thinkLet used.

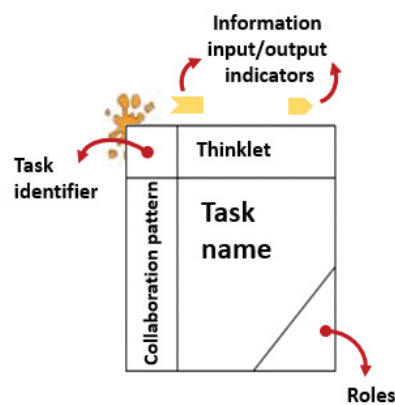


Figure A.1 Representation of an task in the MFP, using HAMSTERS elements






Symbol	Steps
	Cognitive Analysis
	Share information
	Collaborative cognitive activity (analysis or decision making)
	Input data to the system
	Collaborative input data to the system

Figure A.2 Graphical representation of collaborative activities

To establish the SPL goals.Task: Initial meeting

Sub-task: Assemble the profile of the line

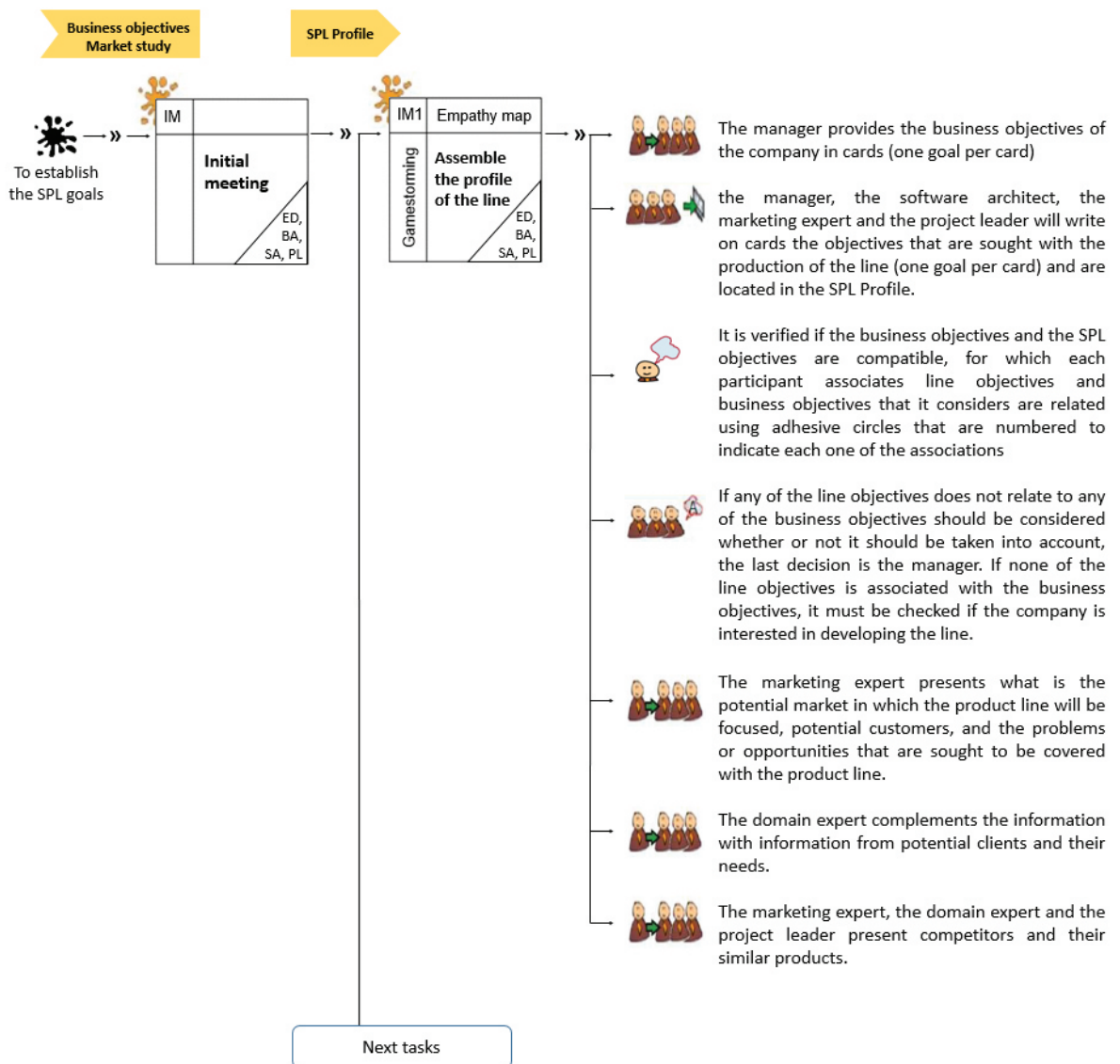


Figure A.3 Initial meeting

Sub-Task	<i>Assemble the profile of the line</i>
Task	Initial meeting
id	IM1
Description	The objective of this task is to give an opening to the scoping, it is sought that all the team that will participate in the scoping may know what the objectives of the company and the objectives of the line are, verifying that these match. This task gives the opportunity for the participants to get to know each other and express their interests in the production of the product line.
Collaborative pattern	Gamestorming
ThinkLet	Empathy map
Mandatory roles	Expert Domain of application (ED) Business Administrator (BA) Software Architect (SA), SPL Project Leader (PL) Marketing expert (ME)
Optional roles	Potential Customers (PC) Sales staff (SS) Domain analyst (DA), Technical expert (TE), SPL Expert (LE) Teamwork Advisor (TA)
Input artefact	Business objectives Market study
Output artefacts	SPL Profile
Steps	<ol style="list-style-type: none"> 1. The manager provides the business objectives of the company in cards (The cards are located in the area business objectives). 2. the manager, the software architect, the marketing expert and the project leader will write on cards the goals that are sought with the production of the line (one goal per card) and are located in the SPL Profile. (The cards are located in the area: line goal 3. Verify if the objectives of the business and the line goals are compatible, for which each participant associates the line goals and the business objectives that he considers that are related by using adhesive circles that are numbered to indicate the corresponding association.

Sub-Task	<i>Assemble the profile of the line</i>
Steps	<p>4. If any of the line goals does not relate to any of the business objectives, so it should be considered whether or not to take into account the last decision of the manager. If none of the line goals is associated with the business objectives, it must be checked if the company is interested in developing the line.</p> <p>5. The marketing expert presents what is the potential market in which the product line will be focused, potential customers, and the problems or opportunities that are sought to be covered with the product line. (The cards are located in the target market area)</p> <p>6. The domain expert complements the information with information from potential clients and their needs. (The cards are located in the target market area)</p> <p>7. The marketing expert, the domain expert and the project leader present the competitors and his similar products (The cards are located in the target market area).</p>
Rules	Each contribution must be written on a card.

Table A.1 Assemble the profile of the line

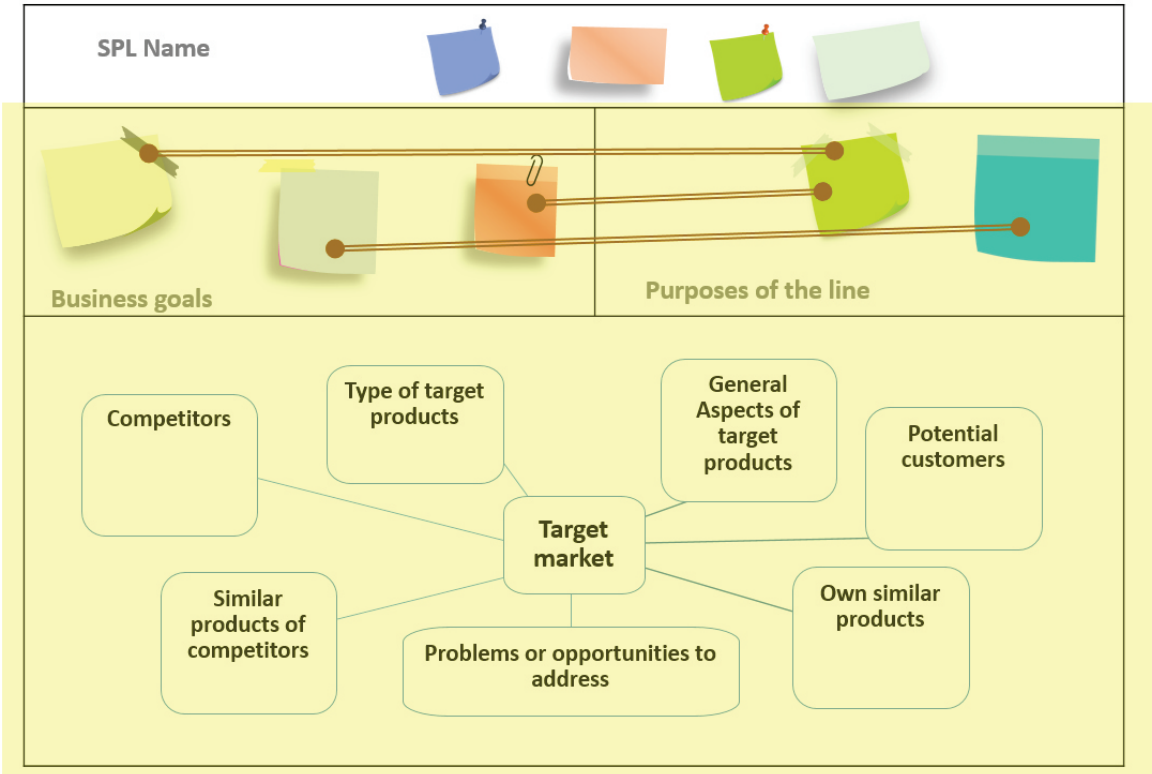


Figure A.4 SPL Profile

Sub-task: Baptize the line

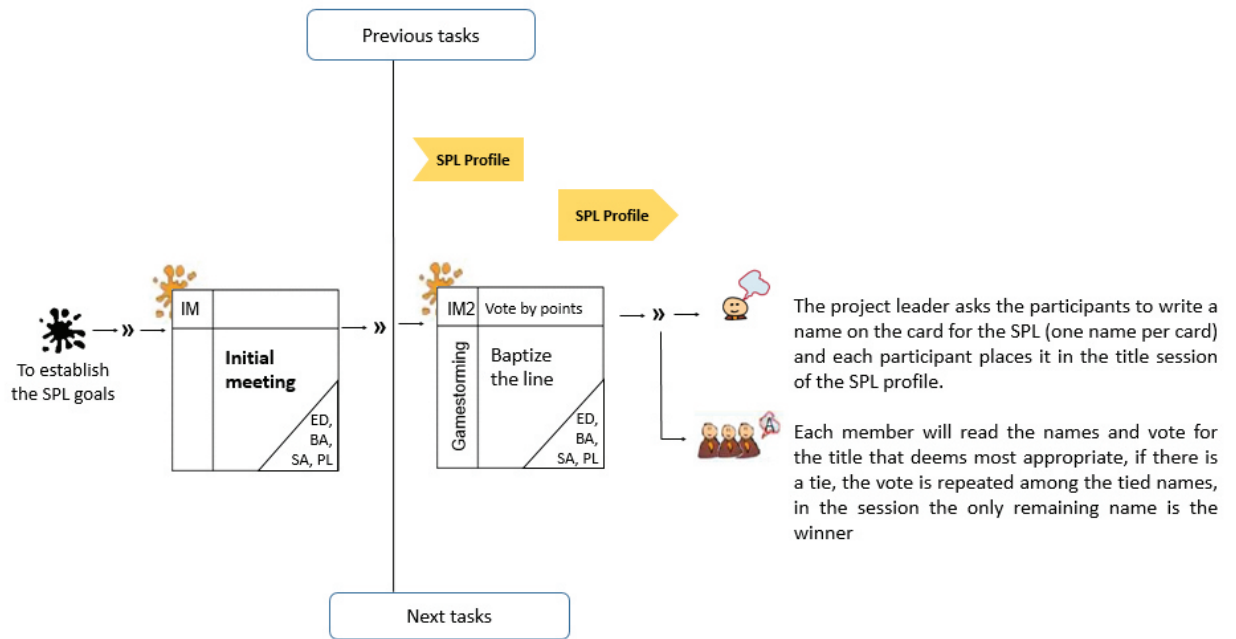


Figure A.5 Baptize the line

Sub-task	<i>Baptize the line</i>
Task	Initial meeting
id	IM2
Description	The objective of this task is to assign a name to the line among all the participants.
Collaborative pattern	Gamestorming
ThinkLet	Vote by points
Mandatory roles	Expert Domain of application (ED) Business Administrator (BA) Software Architect (SA), SPL Project Leader (PL) Marketing expert (ME)
Optional roles	Potential Customers (PC) Sales staff (SS) Domain analyst (DA), Technical expert (TE), SPL Expert (LE) Teamwork Advisor (TA)
Input artefact	
Output artefacts	SPL Profile
Steps	1. The project leader asks the participants to write a name on the card for the SPL (one name per card) and each participant places it in the title session of the SPL profile. 2. Each member will read the names and vote for the title that deems most appropriate, if there is a tie, the vote is repeated among the tied names, in the session, the only remaining name is the winner

Table A.2 Baptize the line

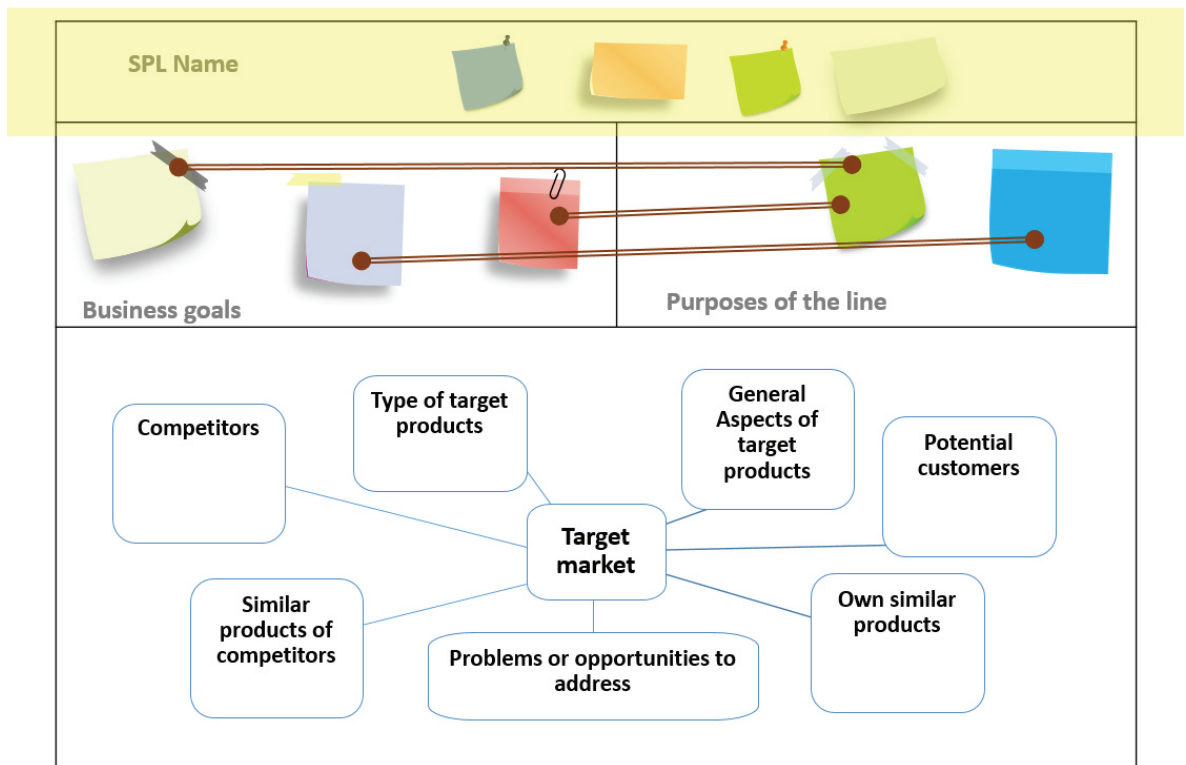


Figure A.6 SPL Profile, SPL Name

To identify features. Task: Identify features

Sub-task: Explore existing products

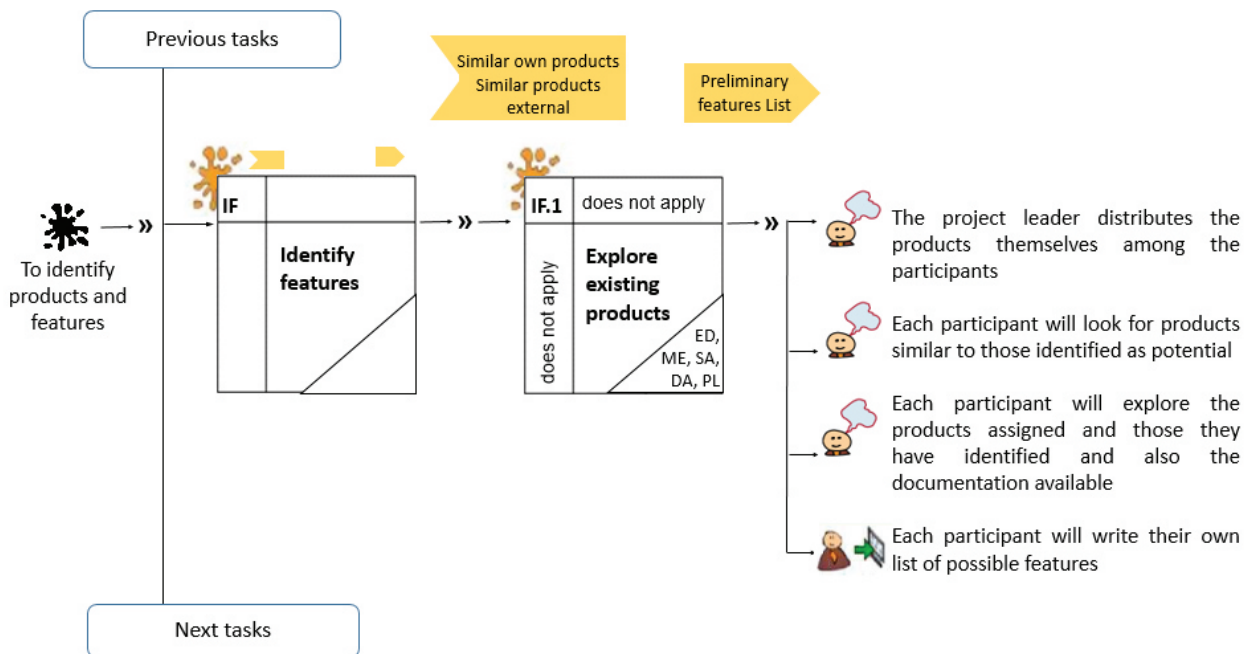


Figure A.7 Explore existing products

Sub-task	<i>Explore existing products</i>
Task	Identify features
id	IF1 (optional)
Description	The objective of this task is to assign a name to the line among all the participants.
Collaborative pattern	does not apply
ThinkLet	does not apply
Mandatory roles	Expert Domain of application (ED) Business Administrator (BA) Software Architect (SA), SPL Project Leader (PL) Marketing expert (ME) Domain analyst (DA),
Optional roles	Potential Customers (PC) Sales staff (SS) Technical expert (TE), SPL Expert (LE) Teamwork Advisor (TA)
Input artefact	Similar own products Documentation of similar products Similar products external
Output artefacts	Preliminary features List
Steps	<ol style="list-style-type: none"> 1. The project leader distributes the products among the participants. 2. Each participant will look for products similar to those identified as potential. 3. Each participant will explore the products assigned and those they have identified and also the available documentation 4. Each participant will write their own list of possible features

Table A.3 Explore existing products

Feature	sub- feature	Description	Product	Own	foreign	New

Figure A.8 List possible features

Sub-task: Propose features

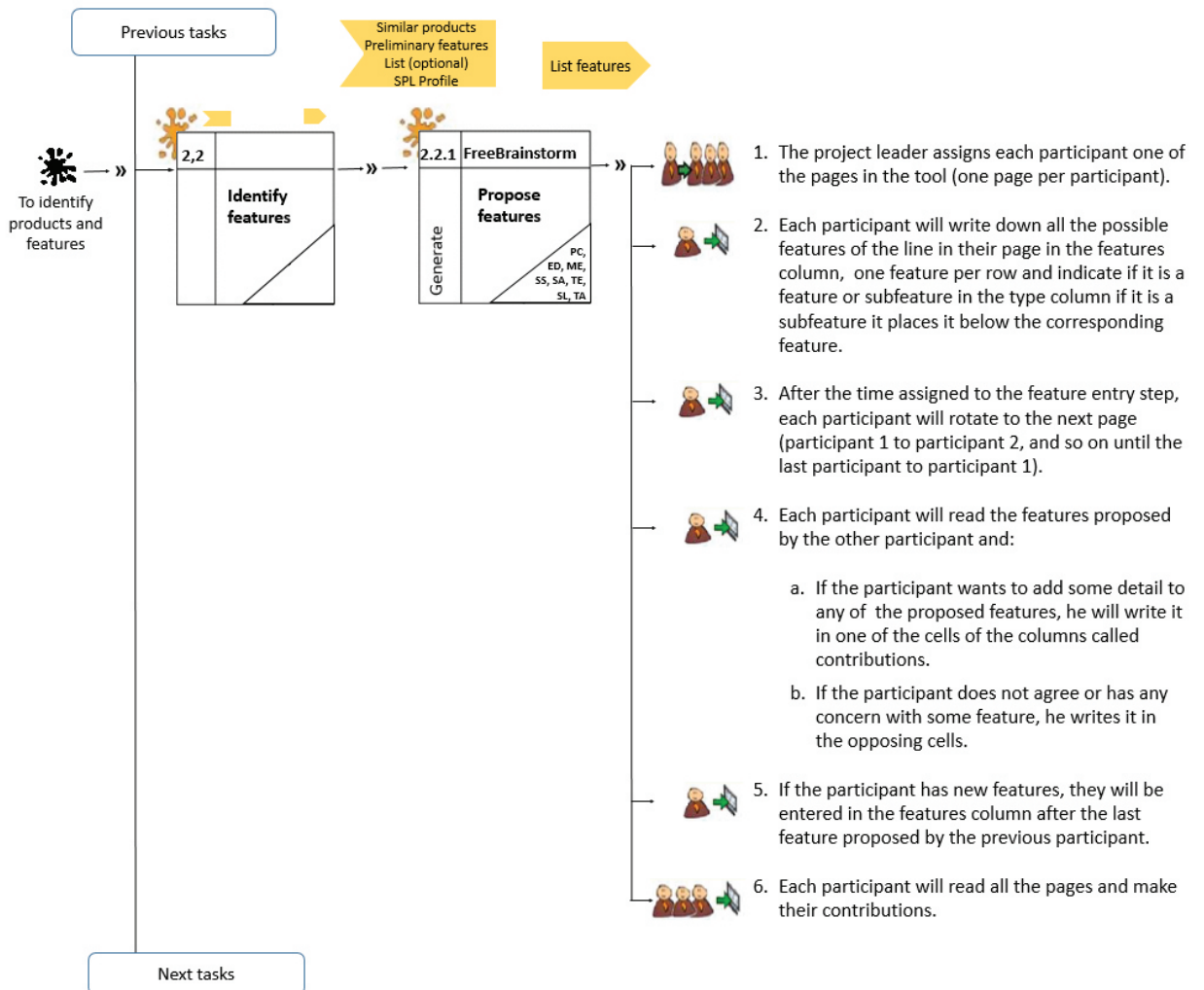


Figure A.9 Propose features

Note: This sub-task can be done using Electronic Brainstorming, or worksheets online or manually.

Sub-task	<i>Propose features</i>
Task	Identify features
id	IF2
Description	The objective of this sub-task is to identify the features that are part of the line, using a brainstorm that allows participants to propose the greatest number of features, taking into account the profile of the identified line and similar products.
Collaborative pattern	Generate
ThinkLet	FreeBrainstorm
Mandatory roles	Expert Domain of application (ED) Software Architect (SA), SPL Project Leader (PL) Marketing expert (ME)
Optional roles	Business Administrator (BA) Potential Customers (PC) Sales staff (SS) Technical expert (TE), SPL Expert (LE) Teamwork Advisor (TA) Domain analyst (DA),
Input artefact	Similar own products Documentation of similar products Similar external products Preliminary features List (optional) SPL Profile
Output artefacts	List features
Steps	<ol style="list-style-type: none"> 1. The project leader assigns each participant one of the pages in the tool (one page per participant). 2. Each participant will write down all the possible features of the line in their page in the features column, one feature per row and he indicates if it is a feature or sub-feature in the type column if it is a sub-feature he places it below the corresponding feature. 3. After the time assigned to the feature entry step, each participant will rotate to the next page (participant 1 to participant 2, and so on until the last participant to participant 1).

Sub-task	<i>Propose features</i>
Task	Identify features
Steps	<p>4. Each participant will read the features proposed by the other participant and:</p> <p>4.1 If the participant wants to add some detail to any of the proposed features, he will write it in one of the cells of the columns called contributions.</p> <p>4.2. If the participant does not agree or has any concerns with some feature, he writes it in the opposing cells.</p> <p>5. If the participant has new features, they will be entered in the features column after the last feature proposed.</p> <p>6. Each participant will read all the pages and make their contributions.</p>
Rules	<p>The participants will start from the profile of the line and similar products</p> <p>No participant can eliminate features proposed by others</p>

Table A.4 Propose features

The image shows a Google Sheets spreadsheet titled "FEATURE LIST" with the following structure:

	A	B	C	D	E	F	G
1	TYPE	ID	FEATURE NAME	DESCRIPTION	OBSERVATION	CONTRIBUTIONS	OPPOSITIONS
2	Feature						
3	subfeature						
4	Feature						
5	Feature						
6	Feature						
7	Feature						
8	Feature						
9	Feature						
10	Feature						
11	Feature						
12							

The spreadsheet interface includes a menu bar (File, Edit, View, Insert, Format, Data, Tools, Add-ons, Help), a toolbar with formatting options (bold, italic, underline), and a participant interface at the bottom with tabs for "participant 1", "participant 2", and "participant 3".

Figure A.10 Features List

Sub-task: Analyze features

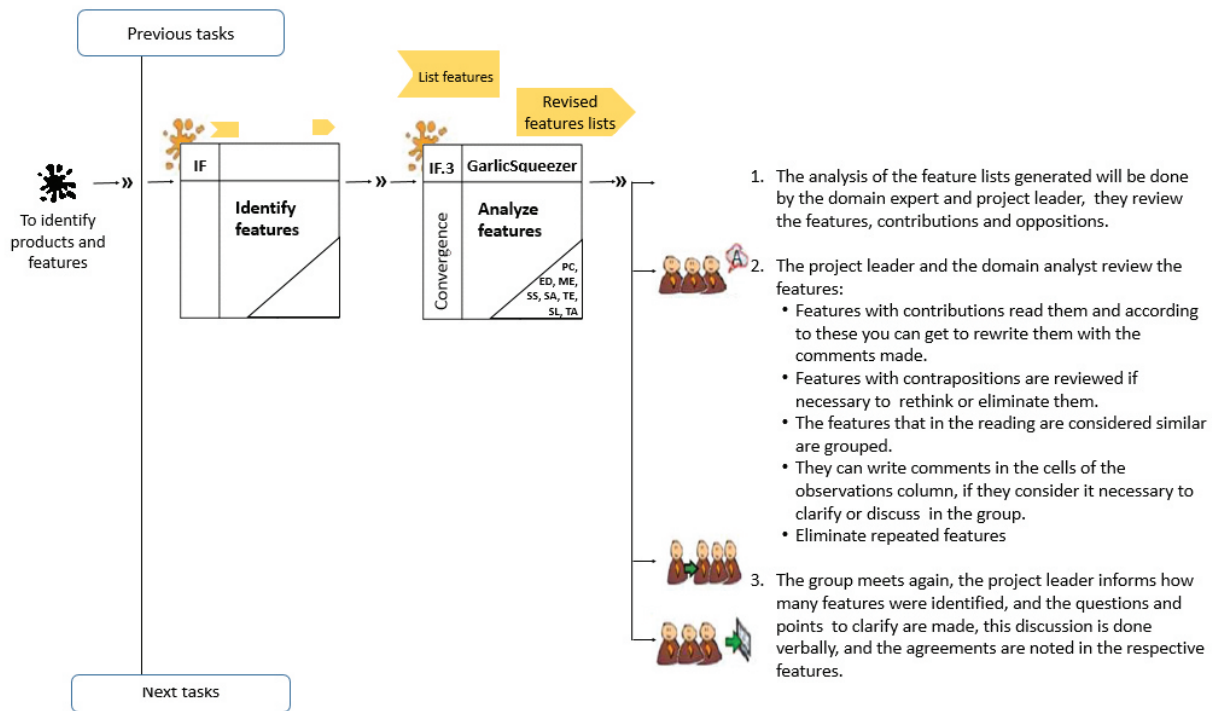


Figure A.11 Analyze features

Sub-task	Analyze features
Task	Identify features
id	IF3
Description	This task seeks to filter features lists, contributions and contrapositions, to achieve a clean list and an agreement by the team
Collaborative pattern	Convergence
ThinkLet	GarlicSqueezer
Mandatory roles	Expert Domain of application (ED) SPL Project Leader (PL) Software Architect (SA), Marketing expert (ME)
Optional roles	Business Administrator (BA) Potential Customers (PC) Sales staff (SS) Technical expert (TE), SPL Expert (LE) Teamwork Advisor (TA) Domain analyst (DA),
Input artefact	List features
Output artefacts	Revised features lists
Steps	<ol style="list-style-type: none"> 1. The analysis of the feature lists generated will be done by the domain expert and project leader, they review the features, contributions and oppositions. 2. The project leader and domain analyst review: <ul style="list-style-type: none"> - Features with contributions, read them and according to these they can rewrite them with the made comments. -Features with contrapositions are reviewed if necessary to rethink or eliminate them. -The features that are considered similar are grouped. -They can write comments in the cells of the observations if they consider it necessary to clarify or discuss in group. -Eliminate repeated features 3.The group meets again, the project leader informs how many features were identified, and the questions and points to clarify are made, this discussion is done verbally, and the agreements are noted in the respective features.
Rules	During step 2, only the project leader and the domain expert remain in the space, in order to make a quick analysis, the more people involved, the discussion becomes longer.

Table A.5 Analyze Features

FEATURE LIST ☆

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	A	B	C	D	E	F	G
1	TYPE	IDENTIFIER	FEATURE NAME	DESCRIPTION	OBSERVATION	CONTRIBUTIONS	OPPOSITIONS
2	Feature						
3	subfeature						
4	Feature						
5	Feature						
6	Feature						
7	Feature						
8	Feature						
9	Feature						
10	Feature						
11	Feature						
12							
13							

+ participant 1 participant 2 participant 3 Feature List

Figure A.12 Features List

Sub-task: Concert features

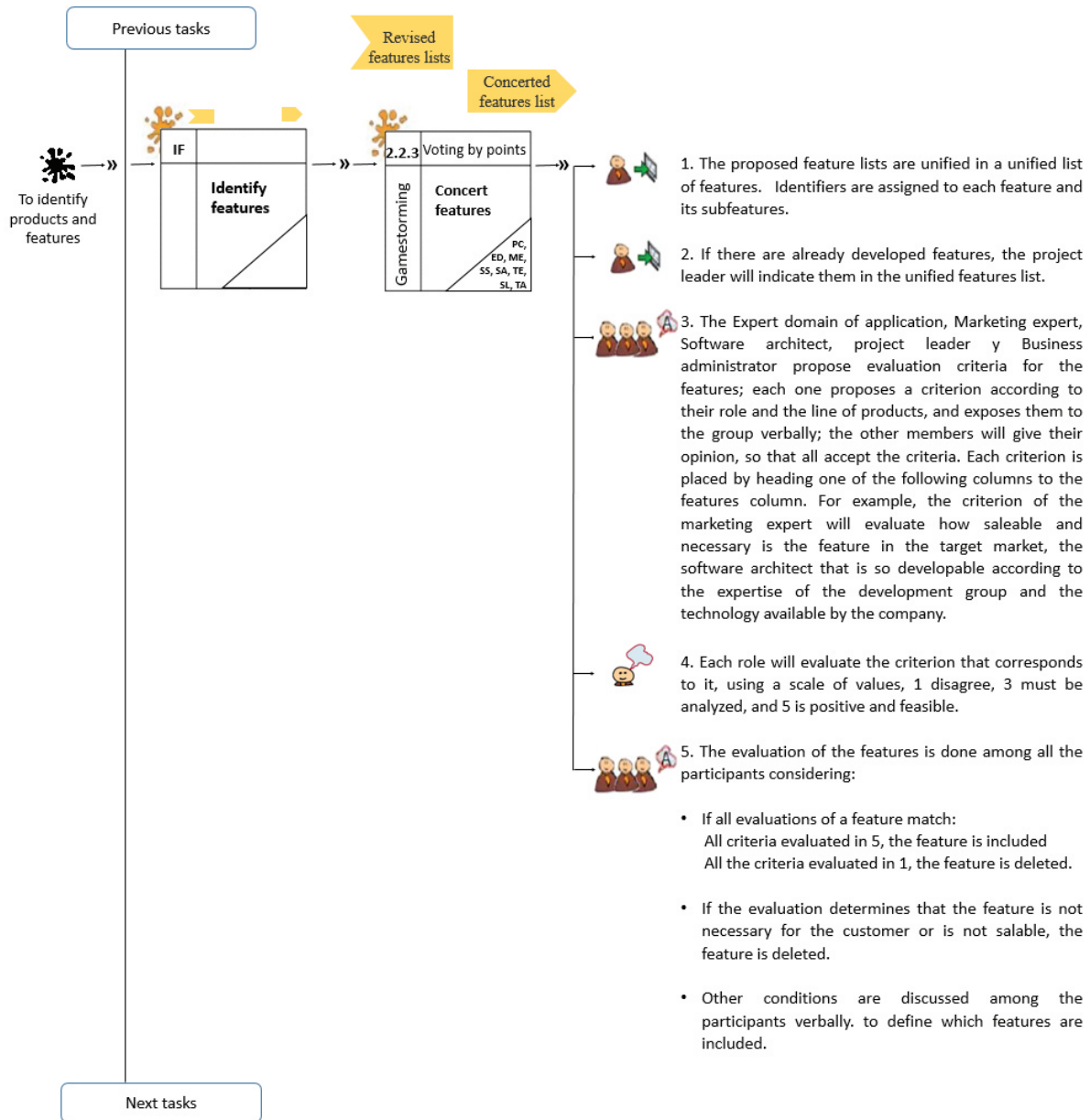


Figure A.13 Concert features

Sub-Task	<i>Concert features</i>
Task	Identify features
id	IF4
Description	The task objective is to make a quick evaluation of the proposed features considering important criteria for the company, and obtain a concerted features list.
Collaborative pattern	Gamestorming
ThinkLet	Voting by points
Mandatory roles	Expert Domain of application (ED) SPL Project Leader (PL) Software Architect (SA), Marketing expert (ME), Business Administrator (BA)
Optional roles	Potential Customers (PC) Sales staff (SS) Technical expert (TE), SPL Expert (LE) Teamwork Advisor (TA) Domain analyst (DA),
Input artefact	Revised features lists
Output artefacts	Concerted features list
Steps	<ol style="list-style-type: none"> 1. The proposed feature lists are put together in a unified list of features. Identifiers are assigned to each feature and its sub-features. 2. If there are already developed features, the project leader will indicate them in the unified features list. 3. The Expert domain of application, Marketing expert, Software architect, project leader and Business administrator propose evaluation criteria for the features; each one proposes a criterion according to their role and the line of products and exposes them to the group verbally; the other members will give their opinion so that all accept the criteria. <p>Each criterion is placed by heading one of the following columns to the features column. For example, the criterion of the marketing expert will evaluate how saleable and necessary the feature is in the target market, the software architect; that is so developable according to the expertise of the development group and the available technology by the company.</p>

Sub-task	Concert features
Task	Identify features
Steps	<p>4. Each role will evaluate the criterion that corresponds to it, using a scale of values, 1 disagree, 3 must be analyzed, and 5 is positive and feasible. (voting method)</p> <p>5. The evaluation of the features is done among all participants considering:</p> <ul style="list-style-type: none"> - If all evaluations of a feature match: All criteria evaluated in 5, the feature is included All the criteria evaluated in 1, the feature is deleted. -If the evaluation determines that the feature is not necessary for the customer or is not saleable, the feature is deleted. -Other conditions are discussed among the participants verbally to define which features are included. <p>The list of characteristics will be cleaned so that only those that have been selected in the evaluation remain</p>
Rules	The participants determine the number and criteria, but it cannot be more than one criterion per participant

Table A.6 Concert features

	A	B	C	D	I	J	K	L	M	N
1	TYPE	ID	FEATURE NAME	DESCRIPTION	% DEVELOPING	CRITERION 1	CRITERION 2	CRITERION 3	EVALUATION	INCLUDED
2	Feature									<input type="checkbox"/>
3	subfeature									<input type="checkbox"/>
4	Feature									<input type="checkbox"/>
5	Feature									<input type="checkbox"/>
6	Feature									<input type="checkbox"/>
7	Feature						1			<input type="checkbox"/>
8	Feature						3			<input type="checkbox"/>
9	Feature						5			<input type="checkbox"/>
10	Feature									<input type="checkbox"/>
11	Feature									<input type="checkbox"/>

Figure A.14 Features List2

To identify products

Task: Identify Products

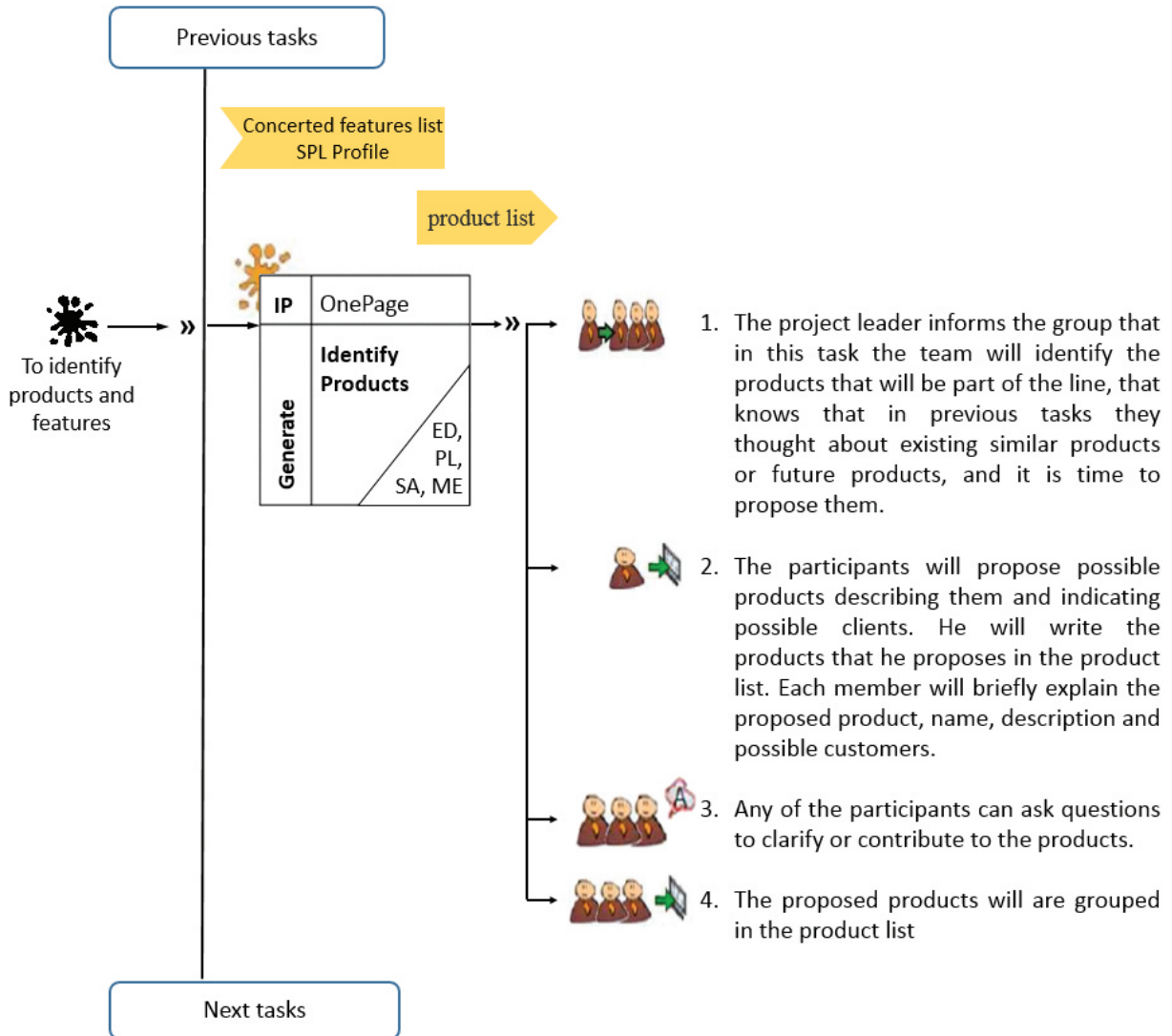


Figure A.15 Identify Products

Sub-task	
Task	<i>Identify Products</i>
id	IP
Description	In this task, the participants will contribute to identifying the products that will be part of the line in the same list or electronic page at the same time
Collaborative pattern	Generate
ThinkLet	OnePage
Mandatory roles	Expert Domain of application (ED) SPL Project Leader (PL) Software Architect (SA), Marketing expert (ME)
Optional roles	Business Administrator (BA) Potential Customers (PC) Sales staff (SS) Technical expert (TE), SPL Expert (LE) Teamwork Advisor (TA) Domain analyst (DA),
Input artefact	Concerted features list SPL Profile
Output artefacts	Products list
Steps	<ol style="list-style-type: none"> 1. The project leader informs the group that in this task the team will identify the products that will be part of the line, knowing that in previous tasks they thought about existing similar products or future products, and it is time to propose them. 2. The participants will propose possible products describing them and indicating possible customers. Each participant will write the products that he proposes in the product list. Each member will briefly explain the proposed product, name, description and possible customers 3. Any of the participants can ask questions to clarify or contribute to the products. 4. The proposed products will be grouped in the product list.
Rules	

Table A.6 Identify Products

Product scoping ☆

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	A	B	C	D	E
1	ID	PRODUCT NAME	DESCRIPTION	POSSIBLE CLIENTS	
2	P1				
3	P2				
4	P3				
5	P4				
6	P5				
7	P6				
8					

+ ☰ participant 2 ▼ participant 3 ▼ Feature List ▼ **Products list** ▼

Figure A.16 Features List 3

To specify the product map00

Task: Tabulate products and features

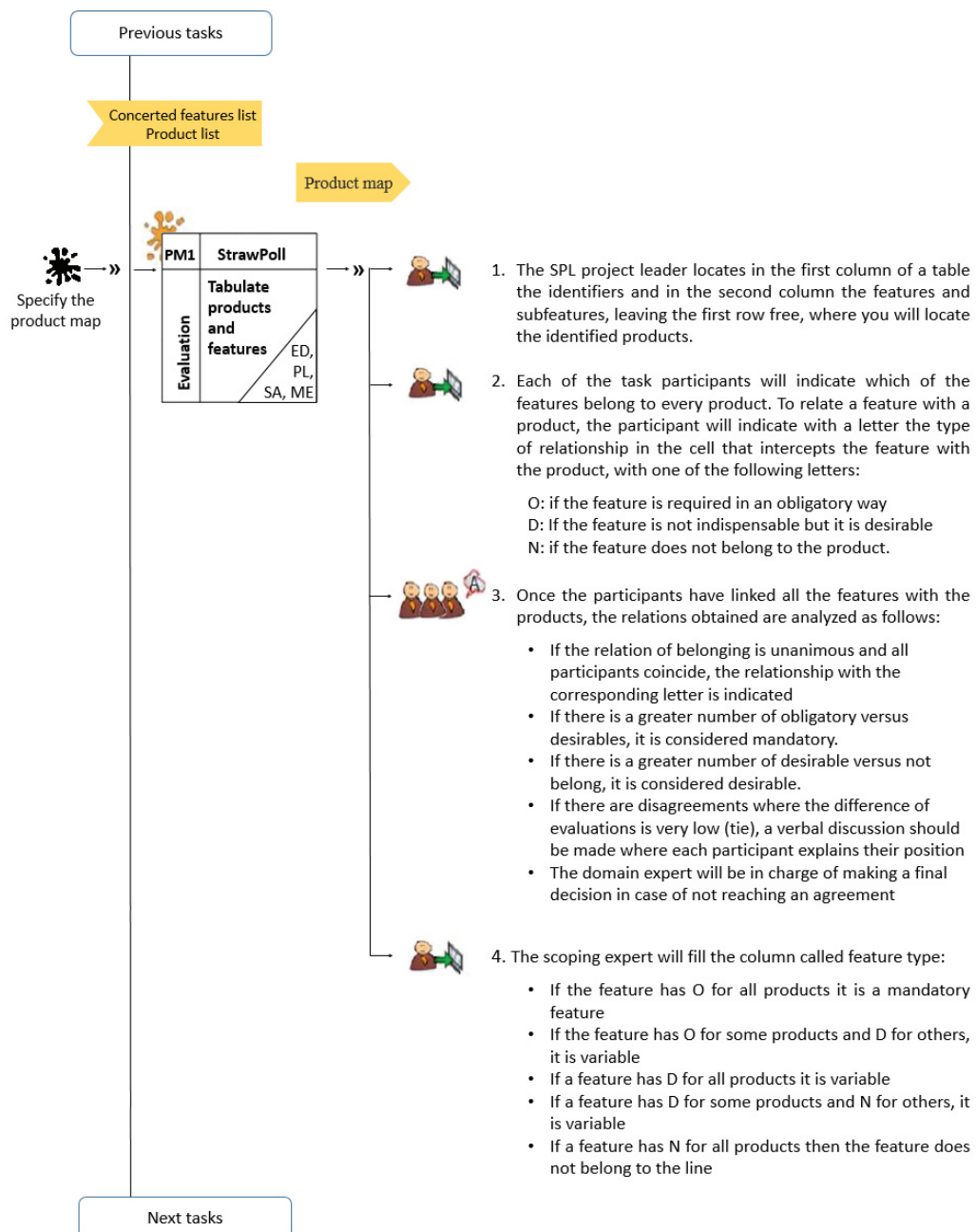


Figure A.17 Tabulate products and features

Sub-task	<i>Tabulate products and features</i>
Task	<i>Specify the product map</i>
id	PM1
Description	The objective of this task is to assign the proposed features to each of the products belonging to the line. With the product map, common and variable features can be identified.
Collaborative pattern	Evaluation
ThinkLet	StrawPoll
Mandatory roles	Expert Domain of application (ED) SPL Project Leader (PL) Software Architect (SA), Marketing expert (ME)
Optional roles	Business Administrator (BA) Potential Customers (PC) Sales staff (SS) Technical expert (TE), SPL Expert (LE) Teamwork Advisor (TA) Domain analyst (DA),
Input artefact	Concerted features list Products list
Output artefacts	Product map
Steps	<p>1. The SPL project leader locates in the first column of a table the identifiers and in the second column the features and sub-features, leaving the first row free, where each participant will locate the identified products.</p> <p>2. Each of the task participants will indicate which of the features belong to every product. To relate a feature with a product, the participant will indicate with a letter the type of relationship in the cell that intercepts the feature with the product, with one of the following letters:</p> <p>O: if the feature is required in an obligatory way D: If the feature is not indispensable but it is desirable N: if the feature does not belong to the product.</p>

Sub-task	<i>Tabulate products and features</i>
Task	<i>Specify the product map</i>
id	PM1
Steps	<p>3. Once the participants have linked all the features with the products, the relations obtained are analyzed as follows:</p> <ul style="list-style-type: none"> - if the relation of belonging is unanimous and all participants coincide, the relationship with the corresponding letter is indicated - if there is a greater number of obligatory versus desirable, it is considered mandatory. - if there is a greater number of desirable versus does not belong, it is considered desirable. - If there are disagreements where the difference of evaluations is very low (tie), a verbal discussion should be made where each participant explains his/her position - The domain expert will be in charge of making a final decision in case of not reaching an agreement <p>4. The scoping expert will fill the column called feature type:</p> <ul style="list-style-type: none"> - if the feature has O for all products it is a mandatory feature - If the feature has O for some products and D for others, it is variable - if a feature has D for all products it is variable If a feature has D for some products and N for others, it is variable if a feature has N for all products then the feature does not belong to the line
Rules	<ul style="list-style-type: none"> - Each participant may assign a single letter per relation - If there is any discrepancy about the type of a feature, the participants will expose their reasons if there is no agreement, the assigned relation is the greatest. - Priority and priority value columns are not filled during this task, these columns will be filled in Task Quantify product map

Table A.7 Tabulate products and features

Product Map

Feature	Sub-features	Product 1	Product 2		Product n	Type	Priority	priority value

Figure A.18 Product map

Task: Validation product map

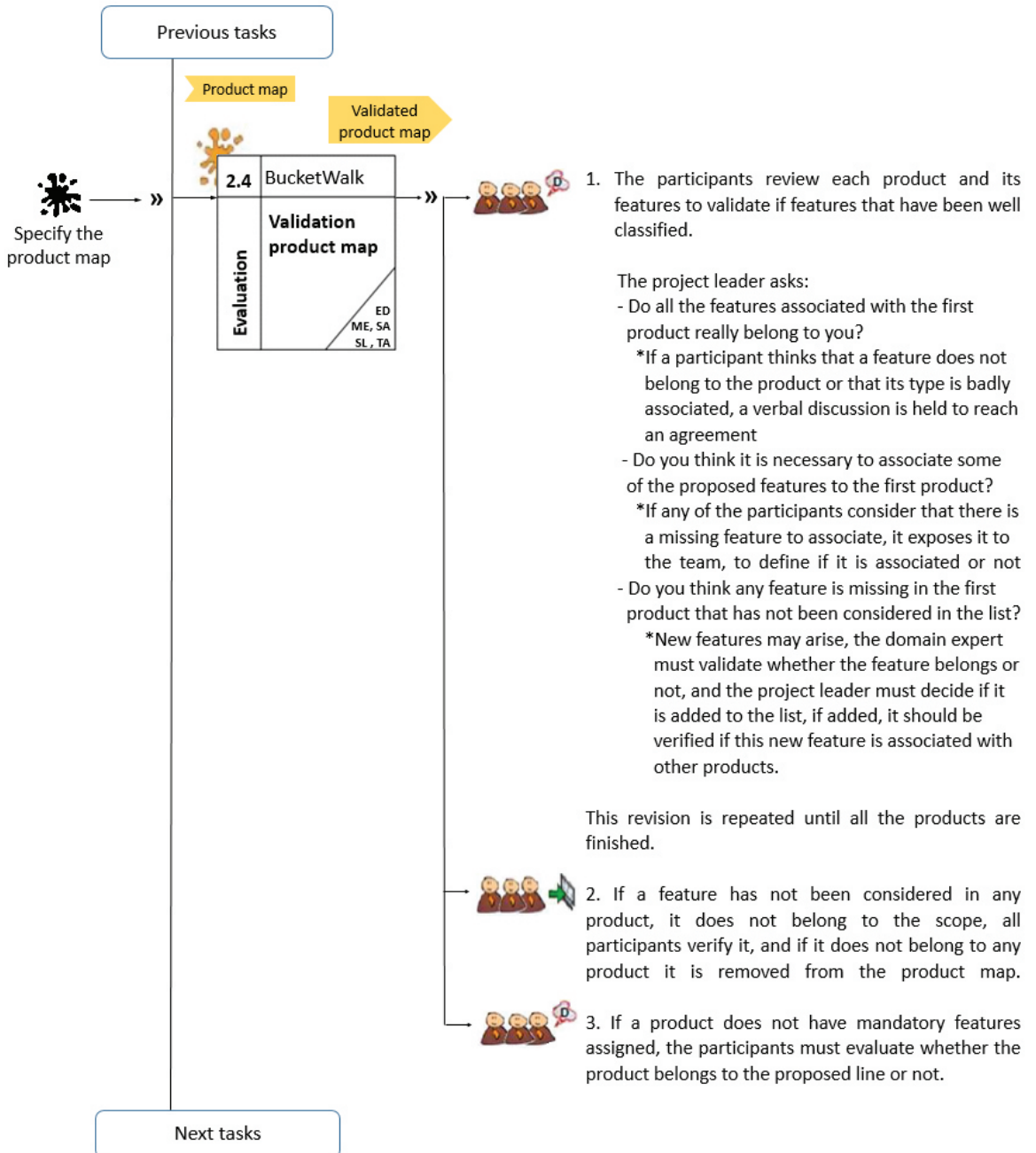


Figure A.19 Validation product map

Sub-task	<i>Validation product map</i>
Task	<i>Specify the product map</i>
id	PM1
Description	The objective of this task is to validate and clean the product map
Collaborative pattern	Evaluation
ThinkLet	BucketWalkChoose
Mandatory roles	Expert Domain of application (ED) SPL Project Leader (PL) Software Architect (SA), Marketing expert (ME)
Optional roles	Business Administrator (BA) Potential Customers (PC) Sales staff (SS) Technical expert (TE), SPL Expert (LE) Teamwork Advisor (TA) Domain analyst (DA)
Input artefact	Product map
Output artefacts	Validated product map
Steps	<p>1. The participants review each product and its features to validate if features have been well classified. The project leader asks:</p> <p>do all the features associated with the first product really belong to you? - If a participant thinks that a feature does not belong to the product or that its type is badly associated, a verbal discussion is held to reach an agreement</p> <p>Do you think it is necessary to associate some of the proposed features to the first product? - If any of the participants considers that there is a missing feature to associate, he/she exposes it to the team, to define if it is associated or not</p>

Sub-task	<i>Validation product map</i>
Task	<i>Specify the product map</i>
id	PM1
Steps	<p>Do you think any feature is missing in the first product that has not been considered on the list?</p> <ul style="list-style-type: none"> - New features may arise, the domain expert must validate whether the feature belongs or not, and the project leader must decide if it is added to the list, if added, it should be verified if this new feature is associated with other products. <p>This revision is repeated until all the products are finished</p> <p>2. If a feature has not been considered in any product, it does not belong to the scope, all participants verify it, and if it does not belong to any product it is removed from the product map.</p> <p>3. If a product does not have mandatory features assigned, the participants must evaluate whether the product belongs to the proposed line or not.</p>
Rules	<ul style="list-style-type: none"> - For a feature to be considered at least it must be included in a product - For a product to belong to the line it must include the mandatory features - A mandatory feature belongs to all products or is variable

Table A.8 Validation product map

To determine functional domains

Task: Identify functional domains

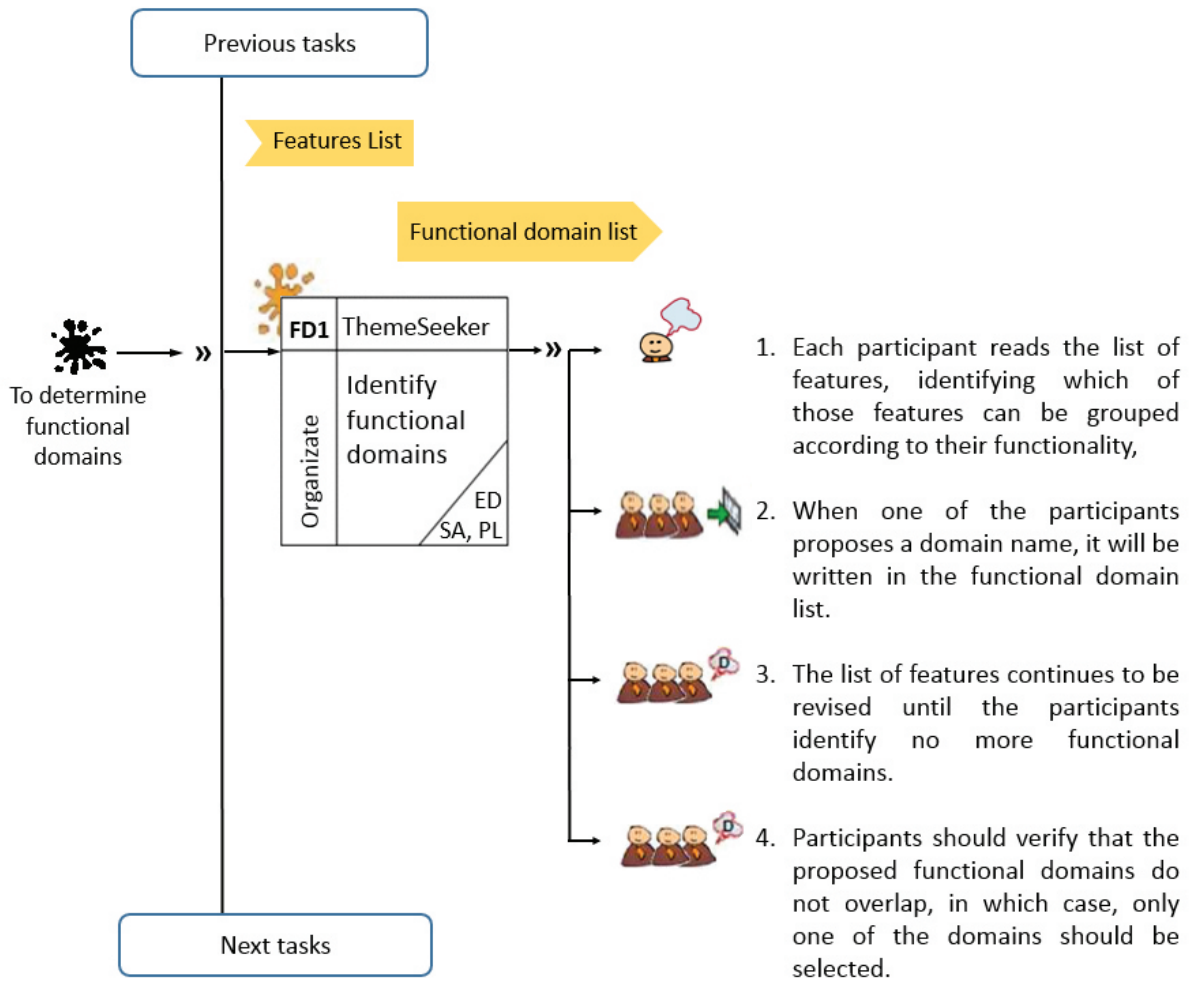


Figure A.20 Identify functional domains

Task	<i>Identify functional domains</i>
id	FD1
Description	The objective of this task is to identify the concepts of a higher level of abstraction that brings together several of the proposed features, considering functional and developmental analogies, these concepts are called functional domains, which will be used to classify the proposed features.
Collaborative pattern	Organizing
ThinkLet	ThemeSeeker
Mandatory roles	Expert Domain of application (ED) SPL Project Leader (PL) Software Architect (SA)
Optional roles	Technical expert (TE), SPL Expert (LE) Teamwork Advisor (TA) Domain analyst (DA)
Input artefact	Features List
Output artefacts	Functional domain list
Steps	<ol style="list-style-type: none"> 1. Each participant reads the list of features, identifying which of those features can be grouped according to their functionality. 2. When one of the participants proposes a domain name, it will be written in the functional domain list. 3. The list of features continues to be revised until the participants identify no more functional domains. 4. The participants should verify that the proposed functional domains do not overlap, in which case, only one of the domains should be selected.
Rules	<ul style="list-style-type: none"> - The domains that overlap each other, or that are sub-domains of others cannot be proposed - The domains cannot be so small that they only group a feature, nor so large that they contain too many features (preferably not greater than 25% of the proposed features)

Table A.9 Identify functional domains

The screenshot shows a Google Sheets interface with the following elements:

- Title Bar:** "Product scoping" with a star icon and a folder icon.
- Menu Bar:** File, Edit, View, Insert, Format, Data, Tools, Add-ons, Help. A status indicator "All changes saved" is visible on the right.
- Toolbar:** Undo, redo, print, insert comment, zoom (100%), currency symbols (\$, %), decimal places (.0, .00), font size (123), font family (Arial), font size (10), bold (B), italic (I).
- Formula Bar:** Contains the "fx" icon and an empty input field.
- Spreadsheet Grid:**

	A	B	C	D	E	F
1	ID	domains	description			
2	d1					
3	d2					
4	d3					
5	d4					
- Tab Bar:** Shows tabs for "participant 2", "participant 3", "Feature List", and "Domains list" (which is highlighted in green). Navigation arrows are present on the right.

Figure A.21 Domain list

Task: Classify features in functional domains

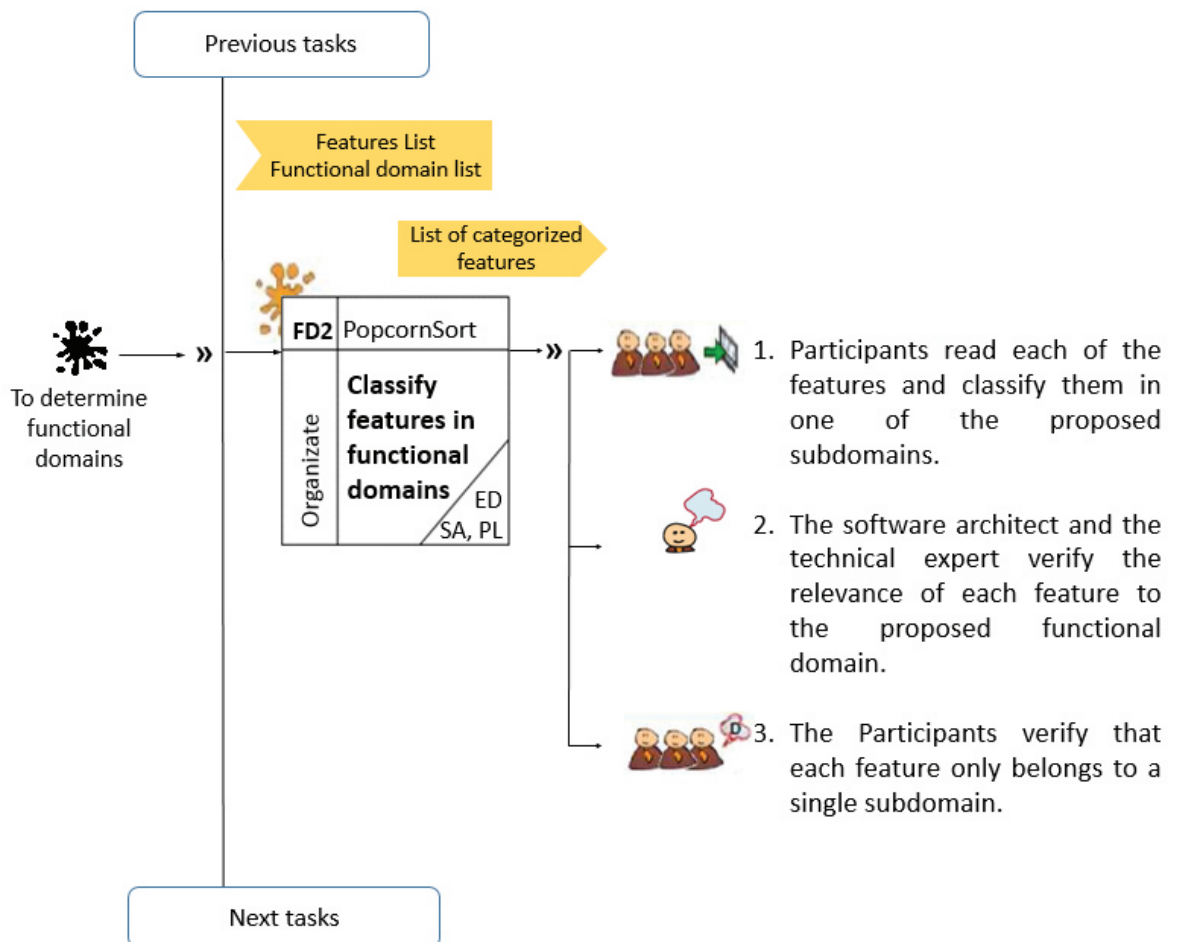


Figure A.22 Classify features in functional domains

Task	<i>Classify features in functional domains</i>
id	FD2
Description	The objective of this task is to classify the features in the functional domains
Collaborative pattern	Organizing
ThinkLet	PopcornSort
Mandatory roles	Expert Domain of application (ED) SPL Project Leader (PL) Software Architect (SA)
Optional roles	Technical expert (TE), SPL Expert (LE) Teamwork Advisor (TA) Domain analyst (DA)
Input artefact	Functional domain list Features List
Output artefacts	List of categorized features
Steps	<ol style="list-style-type: none"> 1. Participants read each of the features and classify them in one of the proposed sub-domains. 2. The software architect and the technical expert verify the relevance of each feature to the proposed functional domain 3. Participants verify that each feature only belongs to a single sub-domain.
Rules	Each feature can only be in one functional domain

Table A.10 Classify features in functional domains

Product scoping

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	A	B	C	D	E	F	G
1	ID	domains	feature 1	feature 2	feature 3		feature n
2	d1		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>
3	d2		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>
4	d3		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>
5	d4		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>
6	d5		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>

Products list D Classification features in domains

Figure A.23 Matrix domains features

To define the assets for reuse

Task: Establish metrics

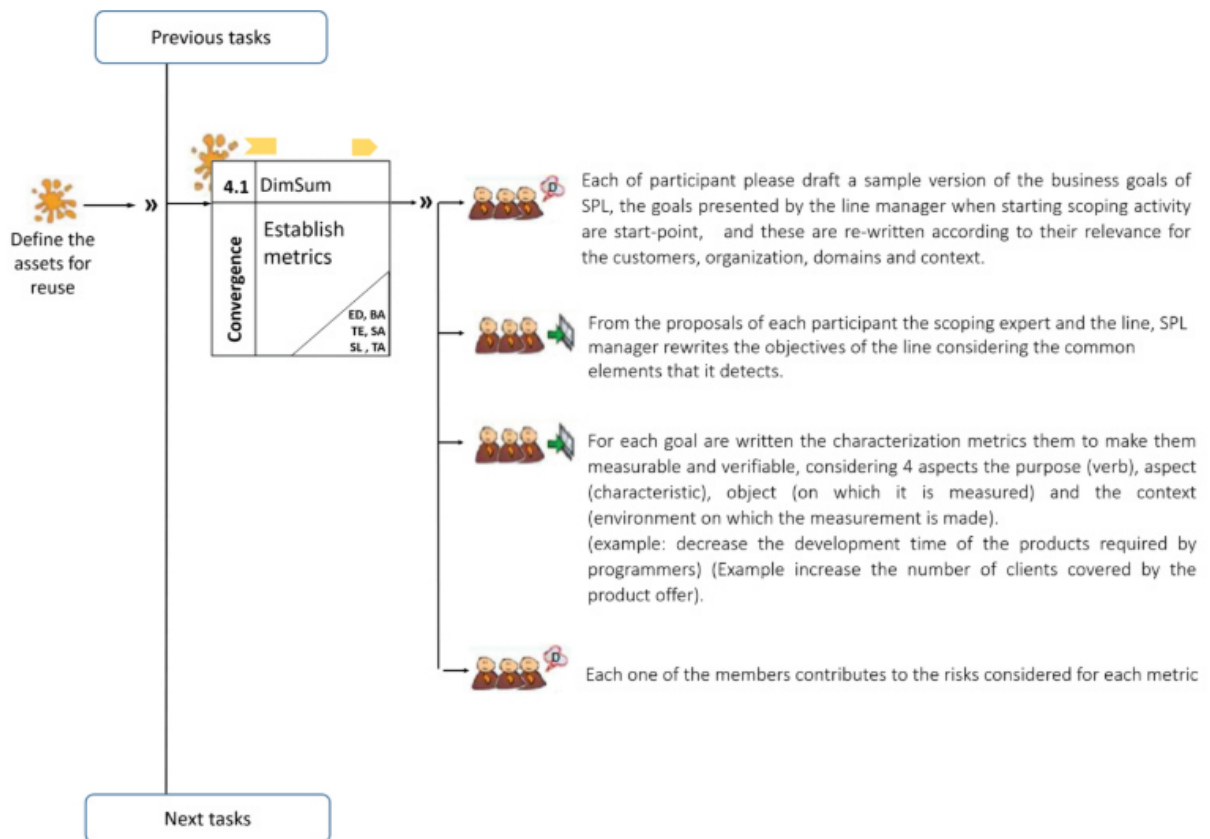


Figure A.24 Establish metrics

Task 7	Establish metrics
id	SA1
Input	Product Line Vision
Description	The task goal is to analyze and refine the business goals established in the vision of the product line, for refining the goals to their relevance for the customers, organization and domains, and express the goal as a characterization metric. It describes the goal as a measurable benefit in the context of production based on reuse, assign to the element or aspect considered to improve a value that allows validating if the benefit was achieved or not.
Collaborative pattern	Convergence
ThinkLet	DimSum
Steps	<ol style="list-style-type: none"> 1. Each participant drafts a sample version of the business goals of SPL, the goals presented by the line manager when starting scoping activity are start-points, and these are re-written according to their relevance for the customers, organization, domains and context. 2. From the proposals of each participant the scoping expert and the line, SPL manager rewrites the objectives of the line considering the common elements that he detects. 3. For each goal characterization metrics are written to make them measurable and verifiable, considering 4 aspects:the purpose (verb), aspect (characteristic), object (on which it is measured) and the context (environment on which the measurement is made). <p>(example: decrease the development time of the products required by programmers) (Example increase the number of customers covered by the product offer).</p> <ol style="list-style-type: none"> 4. Each one of the members contributes to the risks considered for each metric
Rules	Catching business goals must be characterized with at least one metric

Table A.11 Establish metrics

To define the assets for reuse

Task: Quantify product map and functional domains

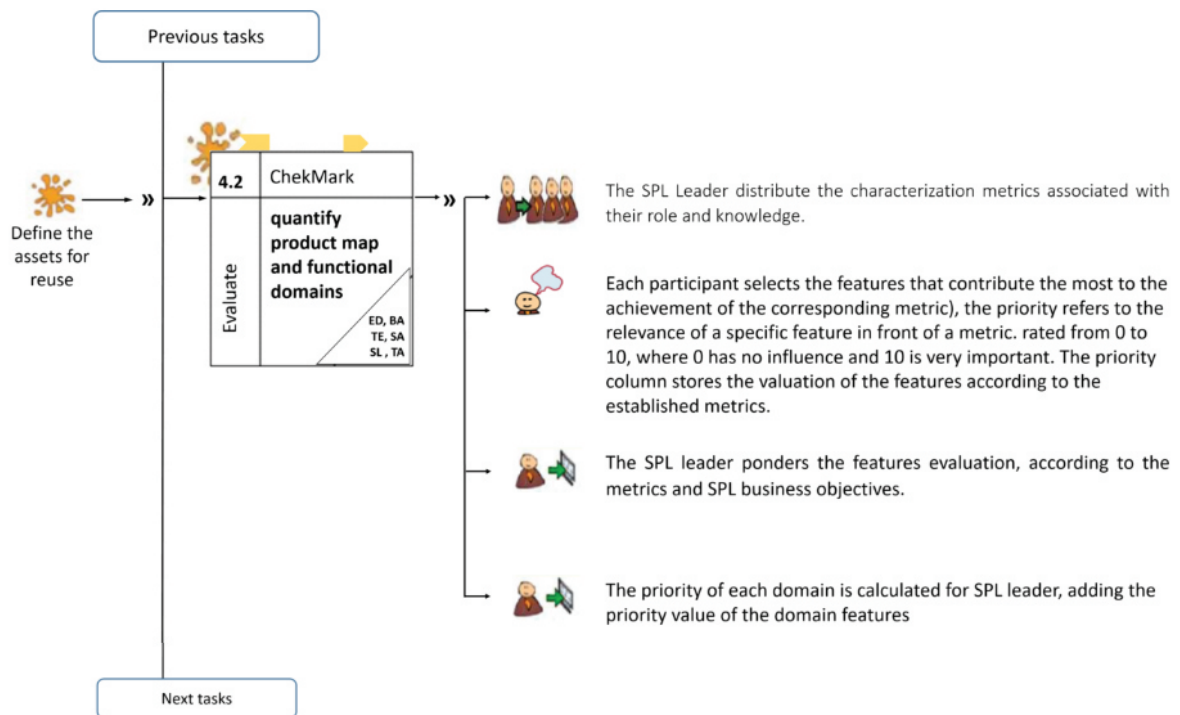


Figure A.25 Quantify product map and functional domains

Task 8	quantify product map and functional domains
Input	<ul style="list-style-type: none"> • Characterization Metrics • product map
Description	The objective is to identify which are the features with the greatest potential, which are critical to achieve the development of the product line and achieve the business objectives.
participating roles	Expert in the domain of application, marketing expert, sales staff, software architect, business administrator, SPL leader, teamwork advisor.
ThinkLet	ChekMark
Output	Quantified product map Quantified functional domains list
Steps	<ol style="list-style-type: none"> 1. The SPL Leader distribute the characterization metrics associated with their role and knowledge. 2. Each participant selects the features that contribute the most to the achievement of the corresponding metric), the priority refers to the relevance of a specific feature in front of a metric. rated from 0 to 10, where 0 has no influence and 10 is very important. The priority column stores the valuation of the features according to the established metrics. 3. The SPL leader ponders the features evaluation, according to the metrics and SPL business objectives. 4. The priority of each domain is calculated for SPL leader, adding the priority value of the domain features
Rules	A maximum number of features that can be selected must be assigned (for example, 25% of the total number of features).

Table A.12 Quantify product map

Product Map								
Feature	Sub-features	Product 1	Product 2		Product n	Type	Priority	priority value

Figure A.26 Quantify product map

Appendix B

Appendix Website of the CoMeS-SPL method

The main objective is to provide the CoMeS-SPL method guide in an easy way to access by interested companies, development groups or researchers, so it has been structured following the flow of the method, and using different forms of specification such as tables and models. In addition, each of the tasks presents the templates of the output work products. Additionally, the page seeks to be a means of exchanging opinions and information, facilitating a forum and providing the contact of CoMeS-SPL developers.

The figure B.1 corresponds to the home of the website

Figure B.2 corresponds to the site map indicating the sections included, the description of the method, the publications and the contact

To access most of the information available on the website it is necessary for the user to register,

or can be accessed using the guest user:

login: invitado

Password: invitadospl

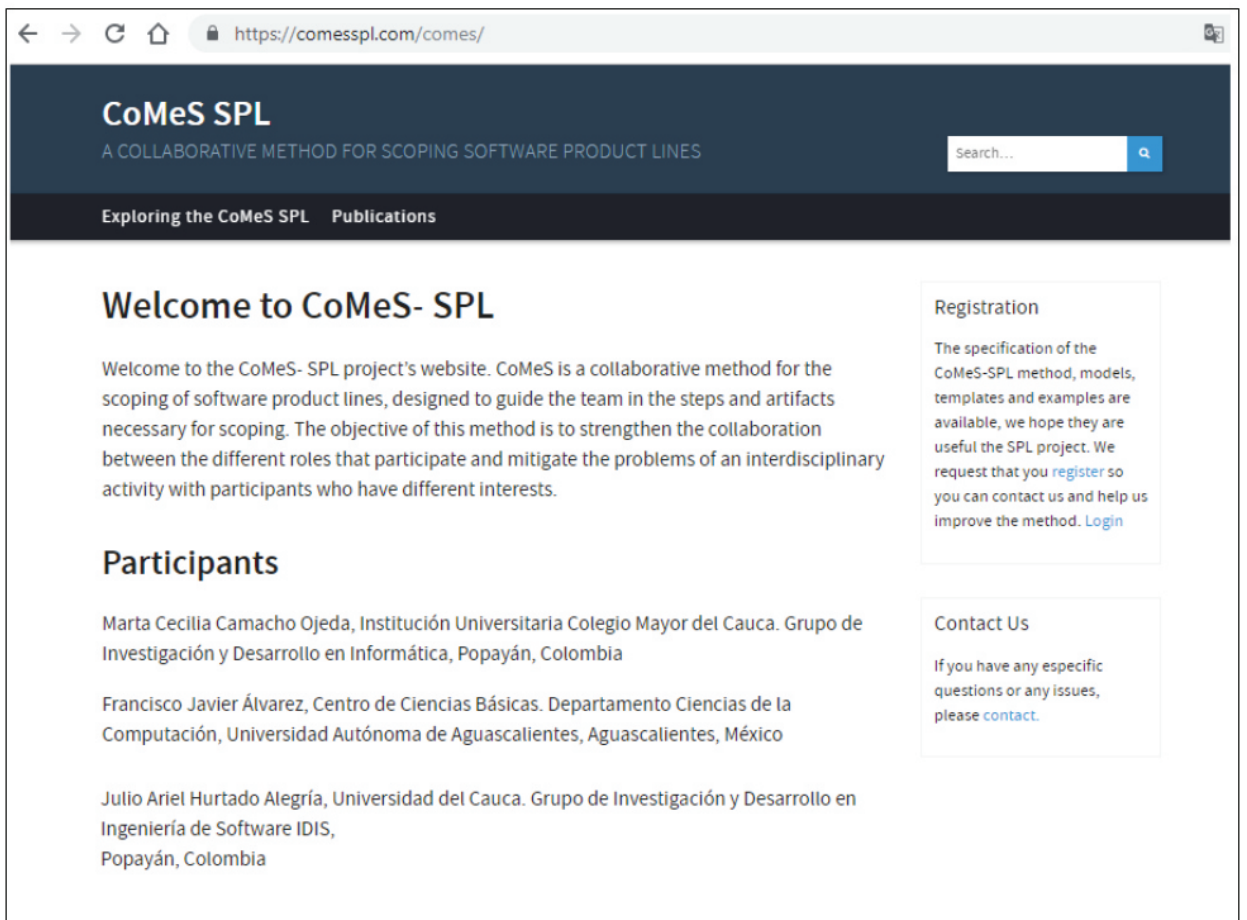


Figure B.1 Homepage

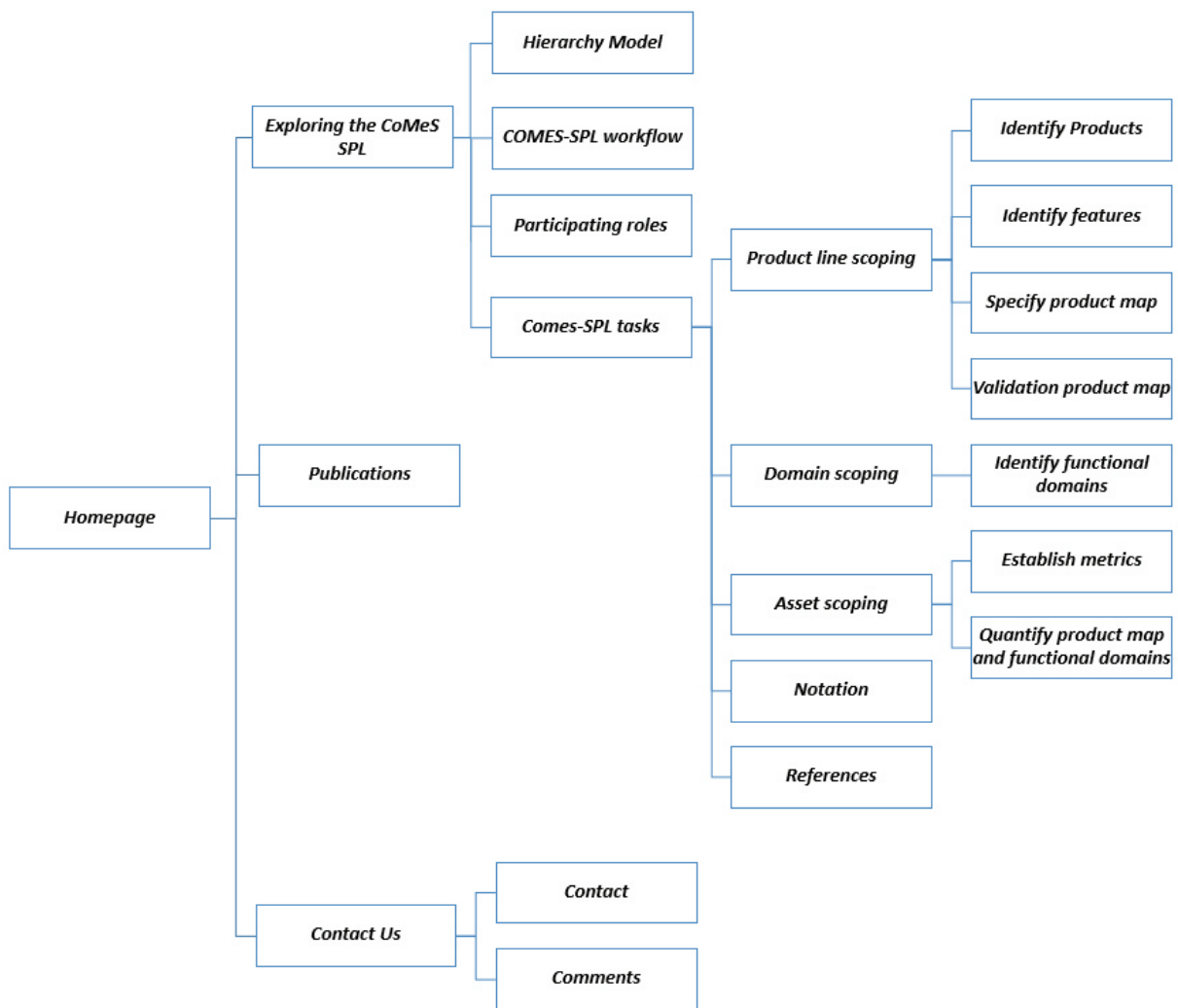


Figure B.2 Site map

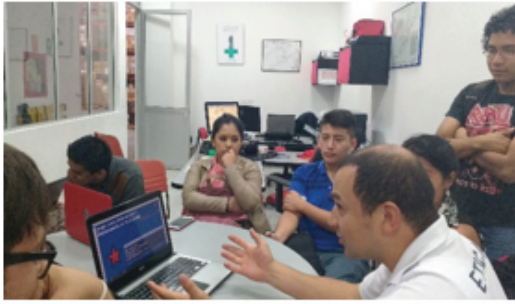
Appendix C

Appendix Exploratory study

Photos of exploratory study



C.1 First group of photos exploratory study



C.2 Second group of photos exploratory study

Instruments used in the exploratory study

DETERMINACIÓN DEL ALCANCE DE UNA LÍNEA DE VIDEOJUEGOS SERIOS

Las siguientes prácticas corresponden a la determinación del alcance de una línea de productos software, el objetivo es explorar estas prácticas en el dominio de juegos de entrenamiento y los resultados obtenidos por los grupos en la práctica realizada. La información recolectada se usará únicamente para el proyecto investigativo y no incide en los resultados académicos.

Dependencia de la empresa: _____

1. Práctica: Examinar los productos existentes

Objetivo: identificar las similitudes y diferencias de los potenciales productos

Listado de los productos	
Similitudes (Número de productos)	
Diferencias (Número de productos)	
Posibles características futuras comunes	
Posibles características futuras no comunes	
Elementos que se pueden reutilizar de los productos ya desarrollados	

2. Objetivo de la línea de productos

Objetivo de negocio:

Objetivos de la organización:

Objetivos de los usuarios:

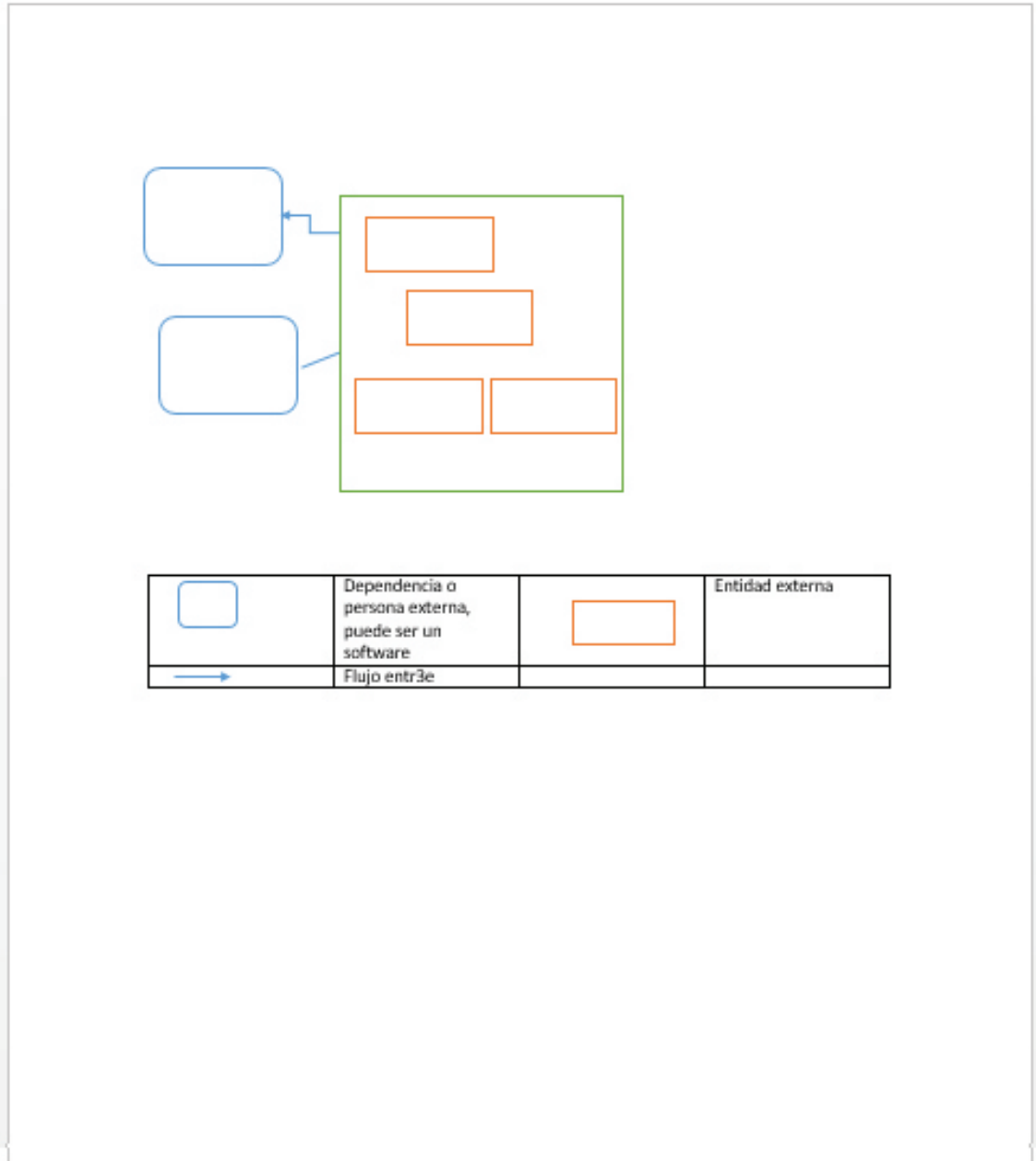
Limitaciones de los productos |

3. Desarrollando una matriz atributos/producto

Para su producto describa cada uno de los siguientes atributos

Puede colocar extensiones o mejoras colocando entre paréntesis (F)

Atributo	Nombre del producto:
Niveles	
Puntaje	
Personaje principal	
Ingreso al juego	
Informe del juego	
Misiones o Retos	
Escenario	
tiempo	
Retroalimentación	
Rankings	
Recompensas	
Estatus o clasificación del jugador	
Personalización	
Usuario administrador	
Competición	
Desafíos y logros	
Avatar	
Insignias	
Desbloques	



C.3 Instrument applied to developers

Cuestionario de Satisfacción
[Juego para la empresa METREX]

Su opinión es importante para tratar de mejorar nuestro desempeño. La información aquí recopilada nos resultará muy útil para conocer sus valoraciones y sugerencias. Por favor, califique su grado de satisfacción en los siguientes puntos, teniendo en cuenta que el 1 implica el mínimo grado de satisfacción y 5 el máximo (maque con una X) ¡MUCHAS GRACIAS!

1. INFORMACION GENERAL	1	2	3	4	5	No aplica
Cumplimiento de los estudiantes para presentar el software realizado						
Cuán satisfecho se encuentra con el software						
La interfaz de nuestro software le fue fácil de usar						
La documentación que acompaña a nuestro software es de gran ayuda						
Recomendaría nuestro software a otras empresas						
Usaría nuestro producto en el futuro						
Es útil el uso de nuestro software para cada dependencia de la empresa						
COMENTARIOS Y SUGERENCIAS:						

C.4 Instrument applied to heads of unit

DISEÑO DE MINI JUEGOS PARA PROCESOS DE INDUCCIÓN

Área	Competencia	Estudiantes	Valoración	
Producción	Línea interna fase 1	Garcés Garcés Lizeth Dayana Serna Trochez Astrid Lorena	Mejor juego	
	línea de producción interna fase 2	Velásquez Martínez Sergio Alejandro Jiménez Guevara Anderson Felipe Bogorge Mera Manuel Alejandro		
	Línea externa fase 1	Caicedo Añazco Yesid López Ortega Edith Marcela		
	Línea externa fase 2	Muñoz Chacón Angie Carolina Grajales Poscue Amanda	Mejor juego, Incluyeron el video para la parte de formación y la evaluación	
	Laboratorio	Laboratorio de Aguas		Caicedo Rendón Andrés Mauricio Pino Anacona Andrés Fabián
		Manejo banco de calibración laboratorio energía	Rosero Piamba Fernando Mauricio Tunubalá Morales Miguel Andersson	
Manejo banco de calibración laboratorio gas		Guacheta Yotengo Iván Darío Chuvila Salazar Lizeth Paola		
Bodega		Manejo de montacarga	Maldonado Arteaga Jonathan Erick Córdoba Peña Juan Manuel	Mejor juego Incluyeron parte aprendizaje, evaluación
	distribución de productos ya empacados	María Alejandra Guacanes Vergara Jhessycka briged castillo ruiz	Peor juego	
	Materia prima	Hernández Lozano Jesús Edrey Mera Inga Miller Andrés	Mejor juego Incluyeron parte aprendizaje, evaluación	
	talento humano	Sistema de Gestión de seguridad y salud en el trabajo (SGSST)		Ibarra Perdomo Julián Eduardo Herrera Rendón Andrés Felipe
filosofía industrial		Sánchez Burbano Julián Alejandro Flor Mera Johan Mauricio	Mejor juego Incluyeron parte aprendizaje, evaluación	

C.5 List of training games and their assessment

DISEÑO DE MINI JUEGOS PARA PROCESOS DE INDUCCIÓN

1. EVALUACION

Microjuego (Competencia) : Línea interna fase 1

Dependencia: Producción

Estudiantes: Dayana Garcés, Astrid Serna

Factor	1	2	3	4	5
Capacidad de enseñanza					
1. El juego transmite o evalúa los conocimientos de la competencia asignada				✓	
Usabilidad					
2. El juego es fácil de usar					✓
Satisfacción					
3. El juego es llamativo y divertido				✓	
Efectividad					
4. Que tan útil considera que sería el juego en el proceso de inducción de sus empleados					✓
Motivación					
5. El juego motiva al empleado para aprender en su proceso de inducción					✓

Gracias por su participación

Cecilia Camacho Ojeda

Docente Facultad de Ingeniería Institución Universitaria Colegio Mayor del Cauca
Estudiante de doctorado Ciencias de la Electrónica, área computación



C.6 Instrument for evaluation of training games

DISEÑO DE MINI JUEGOS PARA PROCESOS DE INDUCCIÓN
 Agenda de la jornada de entrega y evaluación de los microjuegos.

1:30: Salida hacia la empresa
 2:00 pm Llegada a la empresa e ingreso a la sala de reuniones
 2:10 pm Inicio, palabras e instrucciones de la jornada
 2:20 Exposición de los juegos

Horas	Área	Competencia	Estudiantes
2:20	Producción	Línea interna fase 1 (4)	Dayana Garcés Astrid Serna
2:35		línea de producción interna fase 2 (2)	Sergio Alejandro Velásquez Anderson Felipe Jiménez Manuel Alejandro Bojorge
2:40		Línea externa fase 1 (3)	Yesid Caicedo Añasco Edith Marcela López Ortega
2:50		Línea externa fase 2 (1)	Angie Carolina Muñoz ✓ Amanda Grajales Poscua ✓
3:00		Preguntas	
3:10	Laboratorio	Laboratorio de Aguas (1)	Andrés Mauricio Caicedo Rendón ✓ Andrés Fabián Pino Anacona ✓
3:20		Manejo banco de calibración laboratorio energía (3)	Fernando Mauricio Rosero Piamba. Miguel Andersson Tunubalá Morales.
3:30		Manejo banco de calibración laboratorio gas (2)	Iván Darío Guacheta Paola chuvila
3:40		Preguntas	
3:50			
4:00	Bodega	Manejo de montacarga (2)	Jonathan Maldonado Córdoba Juan Manuel
4:10		Distribución de productos ya empacados (3)	María Alejandra Guacanes Vergara Jhessycka briged castillo ruiz
4:20		Materia prima (1)	Jesús Edrey Hernández Lozano ✓ Miller Inga ✓
4:30		Preguntas	
4:40	talento humano	Sistema de Gestión de seguridad y salud en el trabajo (SGSST) (2)	Julián Eduardo Ibarra Andrés Felipe Herrera
4:50		Filosofía industrial (1)	Julián Alejandro Sánchez Burbano Johan Mauricio Flor Mera

5:00 Cierre

C.7 Instrument for evaluation of training games

DISEÑO DE MINI JUEGOS PARA PROCESOS DE INDUCCIÓN

1 EVALUACION

Microjuego (Competencia) : Línea interna fase 1

Dependencia: Producción

Estudiantes: Dayana Garcés, Astrid Sema

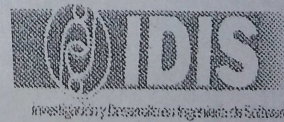
Factor	1	2	3	4	5
Capacidad de enseñanza					
1. El juego transmite o evalúa los conocimientos de la competencia asignada				X	
Usabilidad					
2. El juego es fácil de usar				X	
Satisfacción					
3. El juego es llamativo y divertido			X		
Efectividad					
4. Que tan útil considera que sería el juego en el proceso de inducción de sus empleados				X	
Motivación					
5. El juego motiva al empleado para aprender en su proceso de inducción				X	

Gracias por su participación

Cecilia Camacho Ojeda

Docente Facultad de Ingeniería Institución Universitaria Colegio Mayor del Cauca

Estudiante de doctorado Ciencias de la Electrónica, área computación



DETERMINACIÓN DEL ALCANCE DE UNA LÍNEA DE VIDEOJUEGOS SERIOS

Las siguientes prácticas corresponden a la determinación del alcance (scoping) de una línea de productos software, el objetivo es explorar estas prácticas para el dominio de juegos serios; agradecemos su participación, la información recolectada se usará únicamente con fines académicos.

Nombres de los participantes:

Miller Andres Mera Inga.

Josés Edrey Hernández

1. Practica: Examinar los productos existentes

<p>Listado de los productos</p> <ul style="list-style-type: none"> * Talento humano * Laboratorio Energía * Bodega 	<p>56557 → Julian Ibarra, Andres Herrera</p> <p>LabEnergy → Mauricio Rosero y Marcel Ambsala.</p> <p>Montacargas → Jonathan Maldonado, Juan Coroboa.</p>
<p>Similitudes (Número de productos)</p> <ul style="list-style-type: none"> * Talento humano * Bodega 	<p>56557 → Login, Reporte evalu.</p> <p>Montacarga → Reporte evaluación.</p>
<p>Diferencias (Número de productos)</p>	<p>En algunos juegos encontramos que manejan tiempo, tipo juego 2D, 3D, interacción, niveles, etc, están con algunos de los que encontramos en los juegos.</p>
<p>Posibles características futuras comunes</p> <p>Todos.</p>	<p>Más niveles de juego.</p>

C.9 Instrument applied to the development group

ORDEN DE ASIGNATURAS PARA PROCESOS DE INSTRUCCIÓN

Agenda de la jornada de entrega y evaluación de los microjuegos.

- 1:30 Salida hacia la empresa
- 2:00 pm Llegada a la empresa e ingreso a la sala de reuniones
- 2:30 pm Inicio, palabras e instrucciones de la jornada
- 2:50 Exposición de los juegos

Horas	Área	Competencia	Estudiantes
2:20	Producción	Línea interna fase 1 (3)	Dayana Garcés Astrid Serna
2:35		línea de producción interna fase 2 (2)	Sergio Alejandro Velásquez Anderson Felipe Jiménez Manuel Alejandro Bojorge
2:40		Línea externa fase 1 (4)	Yesid Caicedo Añasco Edith Marcela López Ortega
2:50		* Línea externa fase 2 (1)	Angie Carolina Muñoz Amanda Grajales Poscua
3:00			Preguntas
3:10	Laboratorio	Laboratorio de Aguas (2)	Andrés Mauricio Caicedo Rendón Andrés Fabián Pino Anacona
3:20		Manejo banco de calibración laboratorio energía (3)	Fernando Mauricio Rosero Piamba. Miguel Andersson Tunubalá Morales.
3:30		* Manejo banco de calibración laboratorio gas (1)	Iván Darío Guacheta Paola chuvia
3:40			Preguntas
3:50			
4:00	Bodega	Manejo de montacarga (2)	Jonathan Maldonado Córdoba Juan Manuel
4:10		Distribución de productos ya empacados (3)	María Alejandra Guacanes Vergara Jhessycka brigid castillo ruiz
4:20		* Materia prima (1)	Jesús Edrey Hernández Lozano Miller Inga
4:30			Preguntas
4:40	talento humano	Sistema de Gestión de seguridad y salud en el trabajo (SGSST) (2)	Julián Eduardo Ibarra Andrés Felipe Herrera
4:50		* Filosofía industrial (1)	Julián Alejandro Sánchez Burbano Johan Mauricio Flor Mera

5:00 Cierre

* Mepi Josejo por Citea.

C.10 Instrument for evaluation of training games

DETERMINACIÓN DEL ALCANCE DE UNA LÍNEA DE VIDEOJUEGOS SERIOS

Las siguientes prácticas corresponden a la determinación del alcance de una línea de productos software, el objetivo es explorar estas prácticas en el dominio de juegos de entrenamiento y los resultados obtenidos por los grupos en la práctica realizada. La información recolectada se usará únicamente para el proyecto investigativo y no incide en los resultados académicos.

Dependencia de la empresa: _____

1. Práctica: Examinar los productos existentes

Objetivo: identificar las similitudes y diferencias de los potenciales productos

Listado de los productos	
Similitudes (Número de productos)	
Diferencias (Número de productos)	
Posibles características futuras comunes	
Posibles características futuras no comunes	
Elementos que se pueden reutilizar de los productos ya desarrollados	

Appendix D

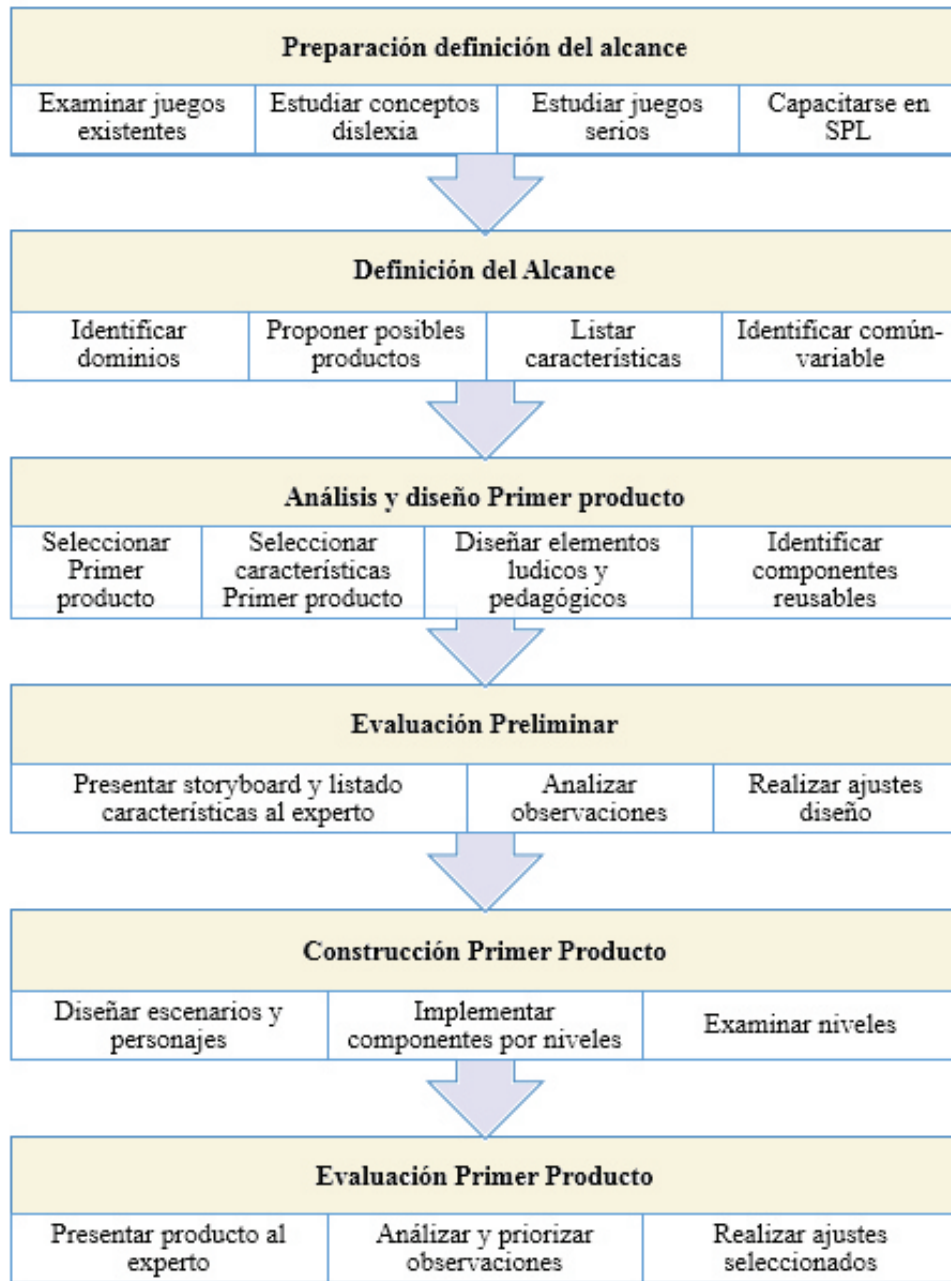
Appendix Comparative study



D.1 First group of photos comparative study



D.2 Second group of photos comparative study



D.3 Comparative study process

Diseño de una línea de videojuegos serios para niños con dislexia

Marco Teórico

Dislexia


Es un trastorno específico de base lingüística, caracterizado por dificultades en la decodificación de palabras escritas. (Gaján, 2011)

Videojuego serio

Es un juego que se juega en un entorno de aprendizaje, pero también que puede entrenar a alguien. (Gómez y Cruz, 2002)

Conjunto de productos que comparten características comunes que satisfacen necesidades específicas de un segmento particular de mercado. (Chen, 2010)

Línea de producto de software



7

Diseño de una línea de videojuegos serios para niños con dislexia

Alcance – Catalogo de Productos



Buscando a pepe pollo



Dislexpace

CATALOGO DE PRODUCTOS



Carretil



De feria



8

Diseño de una línea de videojuegos serios para niños con dislexia

Producto 1: Diseño de Dislexpace



Nivel 1



Nivel 2



Nivel 3



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Diseño de una línea de videojuegos serios para niños con dislexia

Producto 2: Rescatando a Pepe el pollo



Nivel 1



Nivel 2



Nivel 3



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Diseño de una línea de videojuegos serios para niños con dislexia

Validación de los juegos con un Experto

Verificación definición

- Validar si los juegos cumplen con requisitos de los objetivos, aprendizajes y contenidos de aprendizaje.


Evaluación del diseño

- Validar los diseños participativos.
- Validar diseños gráficos y de jugabilidad.

Pruebas

- Analizar los niveles del juego.

Dr. Citliria Patricia López Martínez
Lic. Luis Enrique Acosta Rodríguez (Licenciado en terapia física)



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Diseño de una línea de videojuegos serios para niños con dislexia

Validación de los juegos con un Experto


Aciertos

- Colores llamativos
- Palabras y animaciones llamativas
- Ejercicios contextualizados
- Instrucciones claras

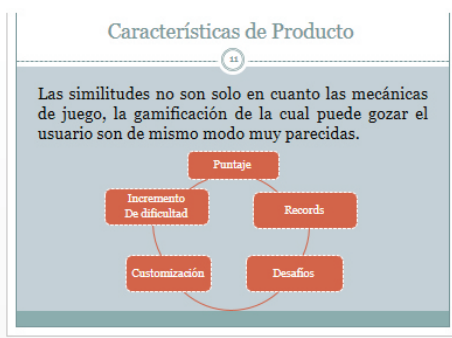
Por Mejorar

- Incrementar el tamaño de las letras
- Implementar audio de juego

Así! Hay que buscar como presentar los resultados de la evaluación de ambos juegos



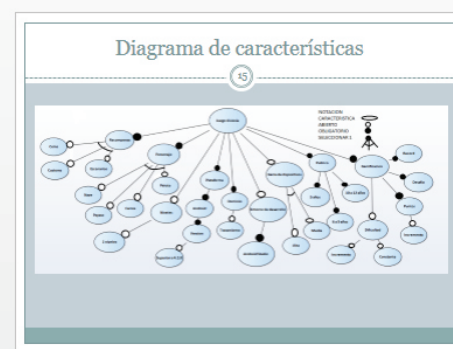
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Matriz de características

Producto/Característica	Avistral	Lin personaje	Puntaje	Customización	Otros niveles	Interactiva	Niveles	Edificial	Records	Desafíos	Demora: Apoyar tratamiento Público 5 a 12 años
SkyClown	X	X	X	X	X	X	X	X	X	X	X
HighWay Leaver	X	X	X		X			X	X		X
Space Chase	X	X	X		X	X			X	X	X
TimeBall	X	X	X	X	X			X	X	X	X

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EQUIPO DE TRABAJO

Roles:

- un asesor sobre dislexia
- un representante de usuarios
- un encargado de marketing
- un asesor técnico
- un desarrollador
- lider del proyecto.




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DEFINICIÓN DEL ALCANCE

• El objetivo de la definición del alcance es establecer el conjunto de juegos que conforman la línea y sus características (plataforma, tipo de juegos, niveles, dinámicas y mecánicas de los juegos)

• Se determinó las edades objetivo, las deficiencias a considerar por lo juegos.

• Se identificaron las características comunes y variables de los juegos propuestos definiendo así un catálogo de productos.



Dominiio: niños con dislexia de 8 a 11 años

Juego	Dificultad de aprendizaje
De feria	Ases de aprendizaje de la lecto escritura, matemáticas.
Dislexpace	Relación imagen-palabras, formación de palabras y reconocimiento de letras.
Mundo de números	Identificación y relación de los números
Números de letras	Formación de palabras.


Dominiio: niños con dislexia de 6 a 8 años

Juego	Dificultad de aprendizaje
Buscando a Pepe el pollo	Orientación espacio, ejercicios de memoria y lateralidad
Carreras	Orientación espacio-temporal, ejercicios de memoria y lateralidad
Paseo por el zoológico	Ejercicios de reconocimiento de formas.
Granja	Orientación espacio-temporal, ejercicios de reconocimiento de formas y lateralidad

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Rescatando a Pepe el pollo

- Dislexia en niños de 6 a 8 años.
- problemas relacionados a la orientación visoespacial
- escenario principal Feria de San Marcos de Aguascalientes México.
- Durante la feria Toromobolas (un pequeño becerro) tiene que rescatar a su amigo Pepe el pollo porque un ladrón lo tiene encerrado en la Monumental plaza de toros.
- Para poder rescatar a Pepe el pollo el niño tiene que jugar y ganar 3 diferentes juegos




Nombre del nivel	Objetivo y tipo de diseño a tratar	Estrategia
Patitos iguales	Ayudar a que el niño encuentre figuras iguales.	Capturar la atención del niño a través de sonidos en el logro y fallo de la actividad. Inducir al usuario con una historia (hacerlo partir de la emoción) Reconocer con un ícono (suena) los logros alcanzados.
Dardos		
Pepeco	Dislexia Vicospacial	



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Rescatando a Pepe el pollo



Niveles	Actividades a realizar
Nivel 1	El usuario identifica las figuras de los patos
Nivel 2	Seleccionar la misma figura del pato
Nivel 3	El usuario tendrá que tocar la pantalla para dibujar la figura seleccionada y continuar con el resto de ellas, así como la obtención de puntos.
Nivel 4	El usuario identifica las figuras que se le presenten (estrella, letras, luci púa).
Nivel 5	El usuario procederá a tocar dentro del tablero para ir las figuras, letras para conseguir puntos.
Nivel 6	Identificar imágenes en las pelotas.
Nivel 7	Ubicar dentro de la pantalla el hueco correspondiente a la imagen de la pelotita.
Nivel 8	Una vez que el usuario haya identificado la imagen requerida tendrá que tocar en la pantalla la imagen correspondiente para la obtención de puntos.

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Dislexpace

Objetivos	Tareas educativas
Nivel 1: Si el usuario de los reconocimientos	Incrementar por el mejoramiento encontrar las letras situadas en de la lectura así como su diferentes matorozos y a comprensión y la identificación completar la palabra que hace de palabras que generalmente aluden a la imagen mostrada, confunden.
Nivel 2: Nopuro, el planta de los silabos.	Disponer al mejoramiento del encontrar la silaba faltante dentro reconocimiento de silabas en de un conjunto de silabas localizadas en orden, sobre la palabra que se muestra en pantalla.
Nivel 3: Muestra el origen de la historia	Inclinación a reforzar la Detención de imagen-identificar si identificación- Relación de la carta mostrada se encuentra en objetos/imágenes.



Publicado en ENITED 2017 Michoacán, Mexico

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Evaluación de los videojuegos

Planteamiento



- Cada grupo planteó el portafolio de productos y sus características, como la edad y las dificultades a las que se enfocan.
- Con la finalidad de verificar la correspondencia entre la edad, las dificultades, los ejercicios y diseño del juego. La pertinencia de los retos para apoyar el tratamiento de las dificultades en cada edad considerada.
- El logopeda sugirió cambios en el nivel de dificultad de algunos juegos, así como indicó que era necesario agregar ayudas con indicaciones para los niños
- El logopeda proporciono las formas, letras y palabras que debían incluirse en el juego.

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Evaluación de los videojuegos

Prototipo primer juego



Para esta evaluación se diseñó una encuesta empleando la escala Likert (Hernández, 2000) y siguiendo algunos de los lineamientos planteados para la evaluación de videojuegos (Katin et Al, 2014).

Según las evaluaciones estos son los aspectos a mejorar:

- Utilizar más animaciones e indicaciones en el juego
- Incluir audios instrucciones y las palabras del juego
- Incluir más retos y que las opciones sean aleatorias.
- Incluir un ranking final que guarde un historial para poder conocer los avances de los niños.
- Usar una fuente de letra clara que facilite la identificación.
- Incluir opciones en el menú para navegar por los escenarios de manera más autónoma.

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Evaluación de los videojuegos

Prototipo primer juego

- Usar una fuente de letra clara que facilite la identificación.



Fuente Antigua (with red X): a, o, s_gundo

Fuente Actualizada (with green check): e, a, o, A_ril

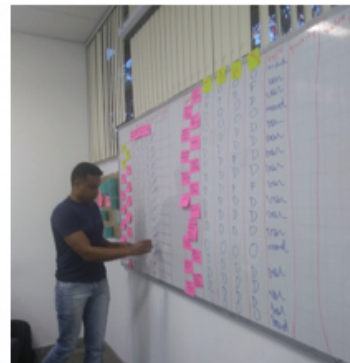
24

Appendix E

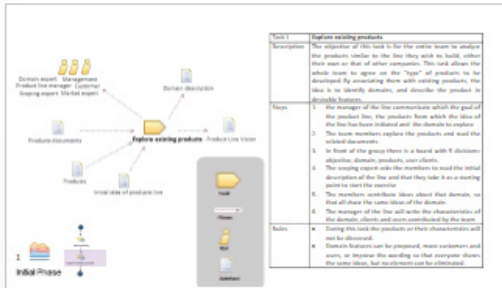
Appendix Study in a context academic expert



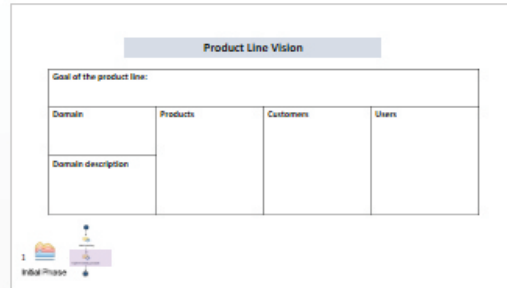
E.1 First group of photos



E.2 Second group of photos



10



11

Example

Phonetics

Dylectra

Phonetics (Dylectra in English) is a game that helps children with dyslexia to overcome their problems of reading and writing through fun games. Phonetics offers:

- 3,000 different word exercises (1,500 in Spanish, 1,500 in English).
- 3 levels of difficulty of exercises: initial, medium and difficult. The levels have been designed according to the frequency of words in Spanish, their length, their morphological complexity and their similarity with other words of the language.
- Exercises in Spanish and English.
- Graphics of evolution of learning.
- Accessories to customize the avatar (avatar).
- Each level contains exercises of 3 types:
 - Insertion: a word is shown with a blank letter, and the user must choose the correct one from a range of possibilities.
 - Separation of words: several words are shown together, and the user must identify where they are separated correctly.
 - Transposition: the syllables or the letters of a disordered word are shown, and the user must order them correctly.

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Example

Product Line Vision

Product Line Vision			
Goal of the product line: offer more products, oriented to deficits of specific ages and scholar grade, and that will offer the option of monitoring therapies and achieved by parents or speech therapists.			
Domain:	Serious games for dyslexia	Products:	spatial relations: the order of things; letters and my first words
Customers:	speech therapists	Users:	children
Domain description:	Serious games that support dyslexia treatment according to the deficits and ages of children		

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A Collaborative Method for Scoping Software Product Lines CoMeS-SPL

Software product line scoping is one of essential and complex activity of SPL development, because it is an interdisciplinary activity with a high impact on the SPL successful. SPL scoping defines belonging relationships to the SPL among of domains, features, reusable assets and products as multi-set (Clements & Northrop, 2001) (Schmid, 2000). For instance, the scoping bounds the product line by defining those products belong to the line and which ones not, it specifies the domain and raises the basis for the construction of reusable assets (Schmid, 2000).

CoMeS is a collaborative method for the scoping of software product lines, designed to guide the team in the steps and artifacts necessary for scoping. The objective of this method is to strengthen the collaboration between the different roles that participate and mitigate the problems of an interdisciplinary activity with participants who have different interests.

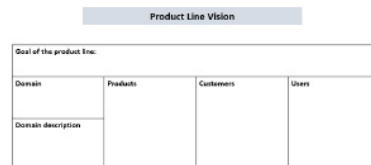
The workflow is presented in Figure 1. The flow presents the tasks to perform the scoping of a software product line.



Below is a description of each of the tasks:

Note: this exercise we started in the exploration of existing products

Task 1	Explore existing products
Description	The objective of this task is for the entire team to analyze the products similar to the line they wish to build, either their own or that of other companies. This task allows the whole team to agree on the "type" of products to be developed by associating them with existing products, the idea is to identify domains, and describe the product in desirable features.
Steps	<ol style="list-style-type: none"> 1. the manager of the line communicate which the goal of the product line, the products from which the idea of the line has been initiated and the domain to explore. 2. The team members explore the products and read the related documents. 3. In front of the group there is a board with 5 divisions: objective, domain, products, user clients. 4. The scoping expert asks the members to read the initial description of the line and that they take it as a starting point to start the exercise. 5. The members contribute ideas about that domain, so that all share the same ideas of the domain. 6. The manager of the line will write the characteristics of the domain, clients and users contributed by the team.
Rules	<ul style="list-style-type: none"> • During this task the products or their characteristics will not be discussed. • Domain features can be proposed, more customers and users, or improve the wording so that everyone shares the same ideas, but no elements can be eliminated.



CoMeS-SPL Survey

Full Name * _____

Please read carefully each statement before answering

Choose the one that you think is closest to the situation described with what happened in the workshop

Mark only one oval.

1. I believe that the SPL scope obtained with the CoMeS-SPL approach are disorganized, unclear, uncoherent and ambiguous

Totally disagree 1 2 3 4 5 Totally agree

2. I believe that the CoMeS approach has enough information to guide the scoping realization

Totally disagree 1 2 3 4 5 Totally agree

3. It is difficult for me to follow the guidelines proposed by CoMeS approach

Totally disagree 1 2 3 4 5 Totally agree

4. The guidelines provided by CoMeS are easy to learn

Totally disagree 1 2 3 4 5 Totally agree

5. I believe that CoMeS approach would increase the time required to scoping

Totally disagree 1 2 3 4 5 Totally agree

6. The identification of the features and products using CoMeS is complex and difficult

Totally disagree 1 2 3 4 5 Totally agree

7. The realization and evaluation of product map using CoMeS is simple and easy to follow

Totally disagree 1 2 3 4 5 Totally agree

8. You believe that scope obtained by the CoMeS approach will be easy to use in the line development

Totally disagree 1 2 3 4 5 Totally agree

9. It was easy for me to understand the instructions and guides proposed by CoMeS

Totally disagree 1 2 3 4 5 Totally agree

10. I would recommend the use of this scoping approach to developing product lines

Totally disagree 1 2 3 4 5 Totally agree

11. I intend to use this approach in the future

Totally disagree 1 2 3 4 5 Totally agree

12. Overall, I found the scoping method to be useful

Totally disagree 1 2 3 4 5 Totally agree

13. I believe this scoping method is useful for building a scope that guides and delimits the line of products

Totally disagree 1 2 3 4 5 Totally agree

14. Overall, I think this scoping method provides an effective means of describing features, products and domains of the line

Totally disagree 1 2 3 4 5 Totally agree

15. I believe that using the CoMeS approach allows the participants to share their knowledge and opinions

Totally disagree 1 2 3 4 5 Totally agree

16. If in the future I am working for a company that wants to adopt SPL I would recommend the use of CoMeS for the scoping

Totally disagree 1 2 3 4 5 Totally agree

Open questions:

17. Do you have any suggestion on how to make this SPL scoping approach more easy to use?

18. What are the reasons that will make usable or not this approach in the future?

19. Do you have any suggestion on how to make this SPL scoping approach achieves a full and useful scope?

20. Please write any other comment or suggestion related to SPL scoping approach in the space below.

Thanks for your participation !!

Perception of collaboration of CoMeS SPL

	in total disagreement	in disagreement	neither agree nor disagree	agree	strongly agree
You believe that CoMeS allows members to express their ideas, knowledge and experiences.					
You believe that CoMeS allows all members to participate at the same level					
You believe that you had the same opportunities to exfoliate and your opinions were just as important as those of others					
You understood the purpose of the CoMeS process					
You understood the objective of each of the tasks of the CoMeS process					
Did you understand the business objective of the product line and what was taken into account throughout the process?					
You believe that all members had the same opportunity to participate.					

EMPIRICAL STUDY
Collaborative Method for Scoping Software Product Lines (CoMeS-SPL)

Background Form

GENERAL INFORMATION

1. Full Name: _____
2. Degree * Graduate, Master, PhD, PostDo: _____
3. Years since graduation * Mark only one option.
 < 1 year
 >= 1 year and < 5 years
 >= 5 years and < 10 years
 > 10 years

TECHNICAL KNOWLEDGE

Select the option that best fits to your profile.
Choose only one.
Mark only one oval.

4. Regarding your Software product lines background *
 I have been involved in software development teams applying the Software Product Line approach
 I am a researcher working on topics related to Software Product Line Development
 I know what Product Lines are but I have never participated in a software project applying SPL development
 I have never heard about Software Product Lines
5. How many years of experience do you have in Software product lines? *
 < 1 year
 >= 1 year and < 5 years
 >= 5 years and < 10 years
 > 10 years
6. Regarding your Software product lines scoping background *
 I have been involved in software product lines development participating in scoping
 I am a researcher working on topics related to software product lines scoping
 I know what is software product lines but I have never participated in a software project applying software product lines scoping

I have never heard about software product lines scoping

7. How many years of experience do you have in Software product lines scoping? *
 < 1 year
 >= 1 year and < 5 years
 >= 5 years and < 10 years
 > 10 years
8. Have you applied scoping in building SPL? *
 Yes, but only in the research domain
 Yes, but only in the industry domain
 Yes, both research and industry domain
 No
9. Have you applied the SPL approach in building software? *
 Yes, but only in the research domain
 Yes, but only in the industry domain
 Yes, both research and industry domain
 No
10. Have you applied the SPL scoping approach in building software? *
 Yes, but only in the research domain
 Yes, but only in the industry domain
 Yes, both research and industry domain
 No

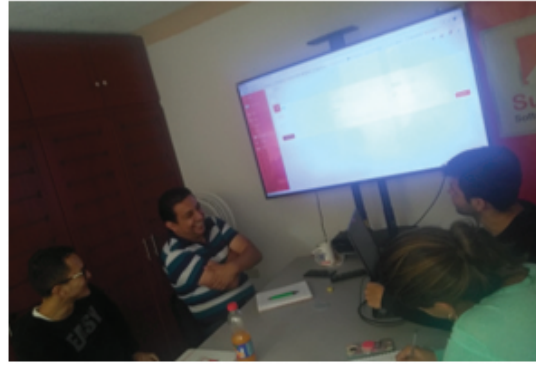
Thanks for your participation !!

Appendix F

Appendix Evaluation of the CoMeS-SPL method



E.1 First group of photos



E.2 Second group of photos

28/7/2019
Evaluación de CoMeS-SPL - Formularios de Google

Evaluación de CoMeS-SPL

PREGUNTAS RESPUESTAS 7

Sección 1 de 6

Evaluación del método CoMeS-SPL en un entorno empresarial

Estamos evaluando el método CoMeS-SPL para la definición del alcance de líneas de productos software, su opinión es muy importante y nos permitirá mejorar el método, los resultados se emplearán en un entorno académico y sin señalar nombres de los participantes.
Por favor, lea cuidadosamente cada declaración antes de responder.

Nombres completos: *

Texto de respuesta corta

Cargo: *

Texto de respuesta corta

Rol en la definición del alcance: *

Texto de respuesta corta

https://docs.google.com/forms/d/1Cwee5PwR0w_dj4eWQ8EJh5LxwP2MgVtUkRwWkdt

28/7/2019
Evaluación de CoMeS-SPL - Formularios de Google

Sección 2 de 6

Título de la sección (opcional)

Seleccione el número que indique su opinión de acuerdo a la afirmación sobre el método

https://docs.google.com/forms/d/1Cwee5PwR0w_dj4eWQ8EJh5LxwP2MgVtUkRwWkdt

28/7/2019
Evaluación de CoMeS-SPL - Formularios de Google

El perfil de la línea (objetivos de la línea, productos objetivo, posibles clientes, competidores, productos similares) es:

1 2 3 4 5

desorganizado organizado

El perfil de la línea (objetivos de la línea, productos objetivo, posibles clientes, competidores, productos similares) es:

1 2 3 4 5

ambiguo claro

El perfil de la línea (objetivos de la línea, productos objetivo, posibles clientes, competidores, productos similares) tiene:

1 2 3 4 5

poca información suficiente información

El perfil de la línea (objetivos de la línea, productos objetivo, posibles clientes, competidores, productos similares) es:

1 2 3 4 5

Inútil útil

El listado de características de la línea es:

1 2 3 4 5

desorganizado organizado

El listado de características de la línea es:

1 2 3 4 5

ambiguo claro

El listado de características de la línea es:

1 2 3 4 5

Inútil útil

El listado de características de la línea tiene:

1 2 3 4 5

poca información suficiente información

Después de la sección 4 [Ir a la siguiente sección](#)

Sección 5 de 6

Sección sin título

Descripción (opcional)

https://docs.google.com/forms/d/1Cwee5PwR0w_dj4eWQ8EJh5LxwP2MgVtUkRwWkdt

Survey to characterize the participants in the case study

ESTUDIO SOBRE LA DEFINICION DEL ALCANCE DE UNA SPL INTRODUCCIÓN AL ENFOQUE DE PRODUCCION DE LÍNEAS DE PRODUCTOS SOFTWARE

Esta es una encuesta que busca establecer el nivel de conocimiento sobre líneas de productos, no existen respuestas incorrectas, y se realiza solo a nivel informativo y totalmente confidencial, le agradecemos que la diligencie de manera sincera.

Información General

Nombre: _____

Título: _____

Cargo en la empresa: _____

Tiempo en la empresa: _____

Años de graduación:

< 1 year >= 1 year and < 5 years >= 5 years and < 10 years > 10 years

Conocimiento relacionado con líneas de productos software

Selecciona la opción que mejor se adapte a tu perfil, Elige solo una opción marcando sólo un óvalo.

1. Con respecto a sus conocimientos respecto a líneas de productos:

- He participado en equipos de desarrollo aplicando el enfoque de la Línea de productos software.
- Soy un investigador que trabaja en temas relacionados con la ingeniería de líneas de productos software.
- Tengo la idea de lo que son las líneas de productos porque asistí a un curso o charla donde hablaron del tema, pero nunca he participado en un proyecto de desarrollo de línea de productos software.
- Tengo la idea de lo que son las líneas de productos porque he leído un poco al respecto, pero nunca he participado en un proyecto de software aplicando el enfoque de líneas de productos software
- Nunca he oído hablar ni he leído de líneas de productos de software.

2. ¿Cuántos años de experiencia en el desarrollo de líneas de productos de software?

ninguno < 1 year >= 1 year and < 5 years >= 5 years and < 10 years > 10 years

3. ¿Cuántos años de experiencia en proyectos de investigación sobre líneas de productos de software?

ninguno < 1 year >= 1 year and < 5 years >= 5 years and < 10 years > 10 years

4. Que entiende por reuso de software:

5. Usted ha reusado software cuando: (puede seleccionar más de una opción)

- ha copiado código y lo ha empleado en otro proyecto
- ha usado partes de software (clases o módulos) desarrollado por otras personas y obtenido en internet y lo ha usado en sus proyectos o tareas
- ha usado partes de software desarrollado por otros compañeros de la empresa y lo ha usado en sus proyectos o tareas.
- ha usado partes de software desarrollado para otros productos o proyectos ya sea suyo o de otros compañeros de la empresa y lo ha usado en otros proyectos o productos.
- ha diseñado y desarrollado módulos o clases con la intención de usarlos en varios proyectos o productos.

6. Explique brevemente como define el alcance de un producto o de un proyecto:

7. Realice un gráfico donde pueda explicar que es el alcance de un proyecto producto

8. Con respecto a su conocimiento respecto a la definición del alcance de una línea de producto software (Definición del alcance = Scoping, Alcance = Scope)

- He estado involucrado en el desarrollo de líneas de productos de software participando en la definición del alcance de la línea
- Soy un investigador que trabaja en temas relacionados con el alcance de líneas de productos de software.
- Sé lo que son las líneas de productos de software, pero nunca he participado en un proyecto de software aplicando el alcance de las líneas de productos de software.
- Sé lo que son las líneas de productos de software, pero no sé qué es el alcance de las líneas de productos de software.
- Nunca he escuchado sobre el alcance de las líneas de productos de software.

9. ¿Cuántos años de experiencia respecto a la definición del alcance de líneas de productos de software?

- ninguno < 1 year >= 1 year and < 5 years >= 5 years and < 10 years > 10 years

10. ¿Ha aplicado el enfoque ingeniería de líneas de productos de software en la construcción de productos software?

- Sí, pero solo en el dominio de investigación
- Sí, pero solo en el dominio de la industria
- Sí, tanto la investigación como el dominio de la industria.
- No, nunca he aplicado ese enfoque

11. ¿Ha aplicado la definición del alcance de una línea de productos de software en la producción de una línea?

- Sí, pero solo en el dominio de investigación
- Sí, pero solo en el dominio de la industria
- Sí, tanto la investigación como el dominio de la industria.
- No, nunca he participado en la definición del alcance de una línea de productos software.

Gracias por su participación

Appendix G

Publications

As a result of the research work, some publications were made. However, it is still pending to publish the results achieved by the last project stage. The papers realized in this research, including its publication stage, are as a follow:

International conferences

- An Exploratory Case Study for Scoping Software Product Lines in a Collaborative Way, Camacho M, Hurtado J, and Alvarez F. Paper presented in 11th International Workshop on Cooperative and Human Aspects of Software Engineering CHASE 18 in the frame of the 40th Conference on Software Engineering ICSE 2018 carried out from May 27 to June 3, 2018 in Gothenburg, Sweden (<https://dl.acm.org/citation.cfm?id=3195852>)
- Identifying Collaborative Aspects During Software ProductLines Scoping, Camacho M, Hurtado J, and Alvarez F, Paper submitted and accepted in Workshop: Experiences and Empirical Studies on Software Reuse (WEESR 2019), that will take place in the 23rd International Systems and Software Product Line Conference (SPLC 2019) will be held from September 9th to 13th, in the city of Paris, France.
- Dislexpace: Videojuego serio para niños con dislexia (Dislexpace:

Serious video game for children with dyslexia) Camacho M, Hurtado J, and Alvarez F, Paper presented in the 1st National Encounter of Technological Innovation for Disability ENITED, held from December 6 to 8, 2017 in Morelia, Michoacán, Mexico; published in the memoirs of event, also selected and published in the book Health, education, culture and innovation technology for disability with ISBN: 978-607-542-048-6.

- Un método colaborativo para determinar el alcance de líneas de productos software (A collaborative method to determine the scope of software product lines), Camacho M, Hurtado J, and Alvarez F, Paper presented at the Doctoral Symposium of the Ibero-American Engineering Conference of Software Conference ClbSE 2018 held from April 23 to 27, 2018, in Bogota.

National conferences

- Toward A domain analysis method for serious video games product lines, Camacho M, and Hurtado J, Paper presented at the doctoral symposium of the 11th Colombian Computer Congress, held from September 20 to 30, 2016 in the city of Popayán.
- Diseñando videojuegos serios para niños con dislexia (Designing serious video games for children with dyslexia), Camacho M, Hurtado J, and Alvarez F, Paper presented in the IV journeys of Computer Human Iteration (HCI), April 23 to 25, 2018 in the city of Popayán.
- A Collaborative Method for a Tangible Software Product Line Scoping, Camacho M, Hurtado J, and Alvarez F, Paper presented at the Workshop on Empirical Experiences and Software Reuse within the framework of the Second International Conference on Applied Informatics ICAI 2018, November 1 to 3 in Bogota

Journals

Published:

- An Incremental Method for Visual Analysis of Software Process Models, Camacho M, Hurtado J, and Ruiz P. Paper published in the Revista Gerencia Tecnológica Informática" ISSN 1657-8236, in volume 15 number 43 Third edition of 2016.