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LIST OF FUNCTIONAL SPECIFICATIONS
Workpackage 1 – Task 1.4

This document consists in the functional specifications for the TRENDS system, integrating end-users needs and technical details.

Acronym	TRENDS
List of participants	LCPI SERAM PERTIMM INRIA ROBOTIKER CRF (FIAT) STILE BERTONE UNIVERSITY OF LEEDS UNIVERSITY OF CARDIFF
Coordinator organization	LCPI SERAM : Laboratoire Conception de Produits et Innovation, SOCIETE D'ETUDES ET DE RECHERCHES DE L'ECOLE NATIONALE SUPERIEURE D'ARTS ET METIERS
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Project Type	STREP (Specific Targeted Research Project)
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0. INDEX

1. INTRODUCTION

1.1 GENERAL CONTEXT: TRENDS PROJECT WP1

The first work-package (WP1) consists of an "**End-User Needs Analysis**". This involves end-users' needs for the proposed TRENDS system.

The objective of WP1 is to specify and validate the end users' needs for the future TRENDS system and software. Within the project end users are represented in the form of participating organizations. Centro Ricerche Fiat and Stile Bertone provide direct access to Marketing, Design and Innovation prospective. Additional information gathered on existing systems and relevant research areas was used to understand the needs of the end users further. Using this data a functional analysis was prepared. This outlines relevant functional specifications which will be used for the following work package.

Work Package 1 (WP1) objectives:

- To define the user needs, and the methodology of interviewing, market analysis, etc.
- To make a world wide state-of-the-art and a market analysis data base on design information systems.
- To define functional specifications for the TRENDS system.
- To validate result data with end users.

1.2 FUNCTIONAL SPECIFICATION OBJECTIVES

The work package was structured in two main phases. The first phase consisted of three initial parallel subtasks:

– T1.1. Interviews with the end-users: designers, engineers and the marketing team at both Centro Ricerche Fiat and Stile Bertone.

– T1.2. Worldwide state-of-the-art on design and innovation information systems

– T1.3. Market analysis with innovation, design and R&D departments.

The "functional specification" phase used previous results of the first phase (T1.1), (T1.2), and (T1.3) as input data for the formalization of a **functional analysis** (T1.4) in which Work Package 1 (WP1) partners participated. This was a collective task combining various points of view about the TRENDS system.

The formalism of the functional analysis can help the different partners to clarify the main functions of the TRENDS system and to characterize them. The functional analysis consists in the definition of the purpose of the future software, its external environment, its life cycle, the main functions it has to offer, and the constraint functions and criteria linked to these functions. It is much used in engineering design because it is a good tool for structuring the needs, offering their visual explicit and quite exhaustive representation. The functional analysis is a good support in multi-disciplinary projects.

The functional analysis consisted of:

- structuring end-users needs and relevant functions from state-of-the-art and market analysis;
- defining the future software objectives, the software external environment and its life cycle;
- expressing the main functions to be offered, the constraint functions and the criteria linked to these functions.

The functional analysis is provided with interviews, state-of-the-art and market analysis synthesis, giving birth to the list of functional specifications: users specifications and functions expressed under the form of a verbal list are provided, with a current situation diagnosis about specific problems and needs identification, and relevant potential functions coming from existing or emerging systems in design and other areas; this task also formalizes an ideal vision of the future system, in terms of trends analysis, idea generation and design activities.

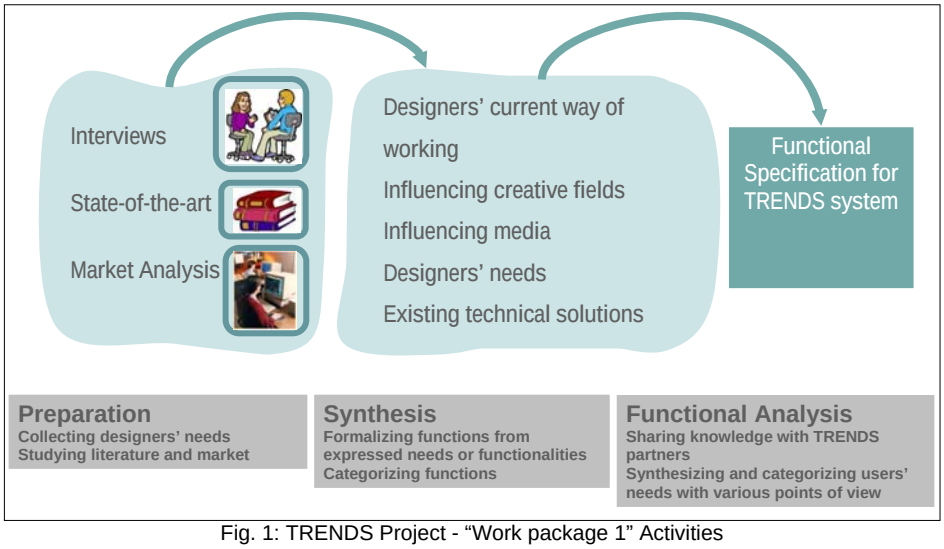

Fig. 1: TRENDS Project - "Work package 1" Activities

1.3 CONTENTS OF THE REPORT

This report is related to the task T1.4. It aims at explaining how the functional analysis method was applied in the context of the TRENDS project and at presenting the results under the form of a list of functional specifications and related criteria. It describes the *functions* and *criteria definition*. Traditionally the functions are discovered by the application of the functional analysis itself. In our case the detailed functions were identified before the application of the method. The functional analysis method was used in a second time for the elaboration of an exhaustive, common and synthetic representation of the main overall functions. These overall functions were the base for categorizing the detailed functions extracted from the needs analysis, the state-of-the-art and the market analysis tasks.

The first part of the report details the protocol linked to the functional analysis. It includes an introduction to the K-J method and to the functional analysis method.

The second part of the report explains the application of the protocol and points up the results. The main result is the list of functional specifications. This part firstly relates the use of the K-J method which was used to obtain a consensual categorization produced by a multidisciplinary group composed of designers, ergonomists, computer scientists, and so, mixing various point of views. Then it is related to the functional analysis. The functional analysis enabled to formalize the TRENDS system functional description. The functions were represented on a synthetic visual diagram showing a synthetic representation of all the detailed functions expressed until there (p15). Each function was then characterized by the developers with specific criteria shown in a table (p18). This characterization will evolve during the project. In fact the criteria table is an scalable tool showing quantitative information about the requirements the software has to fulfill.

In order to keep a user needs driven approach, the early developers (PERTIMM, INRIA) were involved after the extraction and categorization of the users needs. This is the reason why they stepped in the project at the stage of functional characterization, after the definition of the functions.

1.4 T1.4 TASK SCHEDULES

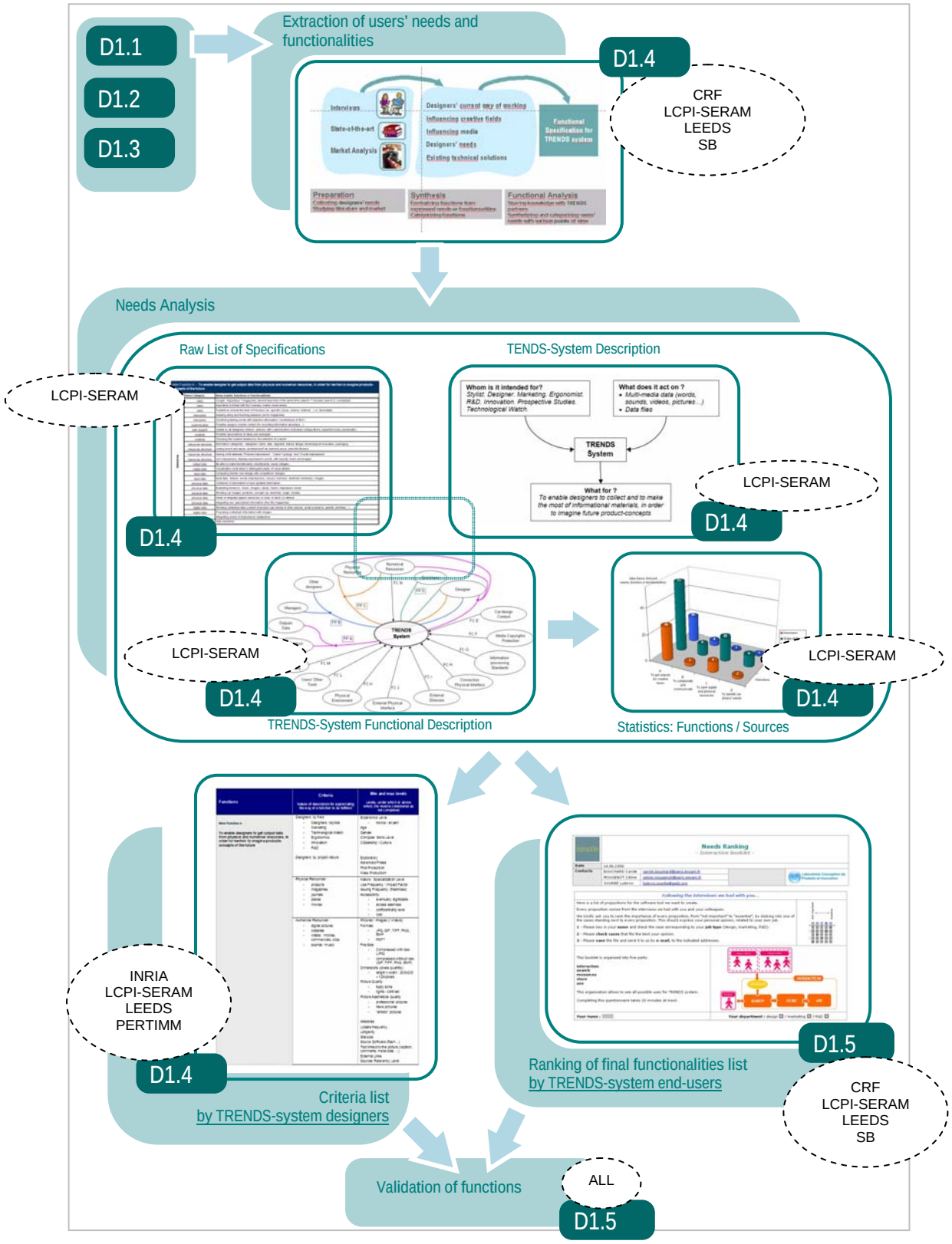

Fig. 2: D1.4 Subtasks Outputs Description

2. PROTOCOL

The task T1.4 *Functional Analysis* was divided into two subtasks:

- the first task was dedicated to categorizing functions we want to find in TRENDS system,
- the second task aimed at creating criteria to be associated with every function.

In the previous steps of the project, end-users were largely involved (see D1.1 for instance). Along this functional analysis protocol, all TRENDS-projects members were involved, especially the TRENDS-system designers (LCPI, UNIVERSITY OF LEEDS) and early developers (PERTIMM, INRIA).

The functional requirements list is made with respect to established methodologies, *K-J* method and *Functional Analysis* method, which are described in the following paragraph (2.2).

2.1 PARTICIPANTS

SERAM-LCPI and the University of Leeds were involved in conducting interviews with end users, reviewing the state-of-the-art and extracting potential functional elements prior to functional analysis.

Participants involved in the functional analysis sessions were members of SERAM-LCPI, PERTIM and INRIA. All members were aware of the TRENDS project content and objectives however their knowledge regarding TRENDS on-going work needed updating.

Standard methodologies used for creative sessions suggest the use of the language which is spoken by the majority of the meeting members; this will further enhance creativity through spontaneous and rapid suggestions. The language adopted in this creative session was French.

2.2 "K.J." METHODOLOGY DESCRIPTION

"The emphasis on user-centred design can be considered a logical extension of the quality movement, as users begin to consider ease-of-use as being central to product quality." [1]

In consideration of this, Babbar et al. have concluded that the use of affinity diagrams (K-J method) methodology should be used in understanding customers' experience. Affinity diagramming methodology contributes to product usability research by providing a method to analyse qualitative end users feedback and enables you to develop a process for identifying underlying dimensions of usability that shape customers' experience with products. [1]

The K-J method was invented by Jiro Kawakita; this method allows groups to prioritize and reach a consensus on opinions and subjective data. Team members may have different opinions on how the group should proceed, and in some situations they may need to analyze a vast amount of subjective data; The K-J method has been an effective tool in both situations. The K-J method is sometimes referred to as an "affinity diagram".

The following process is used in this method [2]:

1. Determining a focus question – This is the basis for each session.
2. Organizing the group – Team members meet, these members are from different parts of the organization thus increasing the varied perspectives received.
3. Writing down opinions/data on sticky notes – Members are asked to brainstorm as many items they can think of.
4. Putting sticky notes (Post-It) on the wall – In random order each participant puts his/her sticky notes on the wall and then reads other people's contributions.
5. Grouping similar items – The facilitator instructs the group to start grouping like items. No discussions are allowed, premature discussion is not encouraged as the group could talk about things which are not relevant to the focus question, and this would waste time.
6. Naming each group – A name is assigned to each group.
7. Voting the most important groups – Each participant shares his/her opinion individually on the most important groups.
8. Ranking the most important group – Once everyone has marked their votes, the sticky notes with the votes on them are placed on the wall and are then ordered by the number of votes each note received with the highest numbers at the top. Some groups may represent identical properties the group is allowed to discuss combining groups. Everyone discusses if they are for or against combining groups. Every time two items are combined their scores are added and they are moved higher in the list. Usually, a point is reached where three or four items which are ranked much higher than the rest, at this point the facilitator stops the process.

2.3 "FUNCTIONAL ANALYSIS" METHODOLOGY DESCRIPTION

The Functional Analysis Method aims at defining and characterizing the different functions that a future system will have to fulfill (figure 3). This approach is very useful to design products, software and services in a multi-disciplinary way with a work team. That is the reason why it was decided to use it in the framework of the TRENDS project. The external functional analysis aims at translating the consumers' expectations in order to express their needs under the form of a functional brief.

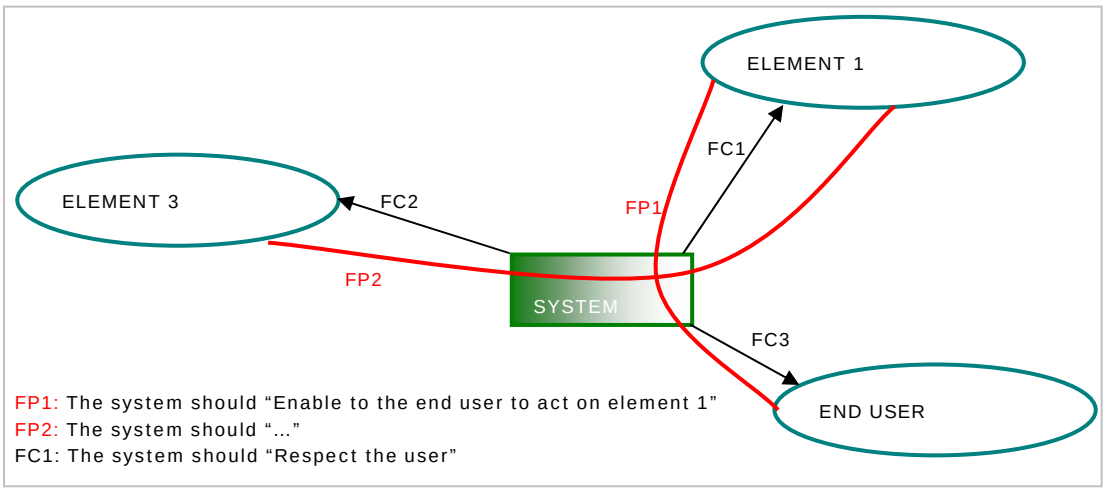

Fig. 3: Functional Analysis Diagram

The following process is used in this method :

1. Product life cycle definition – The life cycle is defined with items like use, storage or recycling
2. Definition of the external elements – Team members are asked to express words for defining the external elements of the studied system. In case it is a software, external elements can be the other existing systems. These elements can be more or less concrete depending on the subject. The search of external elements is done for each step of the product's life cycle.
3. Definition of the system functions – Main functions and constraint functions are then defined on a common diagram (see figure 1) showing the relations between the external elements and the system. The main functions are verbally expressed by two external elements and a verb, while a constraint function is verbally expressed by one external element and a verb.
4. Definition of functions criteria – Criteria of performance are worked out under the form of a specific table aiming to summarize all functions related criteria and to quantify them through a targeted range. For each product's function specific product's characteristics are searched. The final table is named the functional brief. It establishes all the quantified characteristics that the future system should provide.

To conclude, the functional analysis is a powerful methodological tool for counting, characterizing, ordering, and treating the functions of a product on a hierarchical basis. It makes it possible to have a clear vision of the expected requirements of the product, taking into account various points of view arising in the work team.

Its result is the *functional brief*.

3. RESULTS

3.1 EXTRACTION OF USERS' NEEDS AND FUNCTIONALITIES

Previous deliverables D1.1, D1.2 and D1.3 provided us with the outputs of:

- the interviews with TRENDS-system end-users
- the state-of-the-art of research on tools close to TRENDS-system
- a market study about existing tools close to TRENDS-system.

Those deliverables were analyzed in order to extract all information about end-users' needs on *post-its* (e.g.: "being able to compare his/her own design with competitors' design"), as well as information about valuable possible functionalities that could be proposed to the end-users (e.g.: "favoring serendipity in information research").

Browsing D1.1, D1.2 and D1.3 deliverables, we ended up with a set of *post-its* containing around 136 items (table 1) which cover users' needs and interesting functional possibilities for TRENDS-system.

3.2 CATEGORIZATION OF USERS' NEEDS AND FUNCTIONALITIES

The previous raw list was then re-structured by a thematic categorization. The categories were collectively found using the K-J method. The collective categorization was achieved by a multidisciplinary group including designers, ergonomists, and computer scientists.

Fig. 4: Using the K-J method, individual ideas were grouped

Putting data onto sticky notes:

All Information gathered from the interviews, state-of-the-art and market analysis was written down individually on notes. To give the participants and overview, all notes were then placed on the wall in no particular order.

Grouping similar items:

The participants were asked to read the notes collectively and move the displayed ideas at will. They were then asked to place them in particular groups and find a name for each category. This method encourages unconventional thinking.

Naming each group of items:

Each Category is given a one-word name in order to categorize the various proposals, e.g. “creativity”, “interaction”, “digital data”, etc.

The categorization of the whole set of post-its by the work team led to the list of users’ needs and functionalities extracted from D1.1, D1.2, and D1.3 (see below).

3.3 TRENDS SYSTEM DEFINITION

Using the "Functional Analysis" methodology, a team made of developers started structuring a functional brief for the final TRENDS-system. First step was to produce a general definition for the system.

This definition was based on the final "TRENDS system" which is described via the following questions (figure 5 and table 2):

- Who is the TRENDS system intended for?
- What does the TRENDS system act on?
- What is the TRENDS system created for?

The answers were based on the previous list of functions and on the items collected by the participants whom took part in the functional analysis meeting. Even the end users' opinions were taken in consideration since the whole functional analysis is based on end-users' needs list.

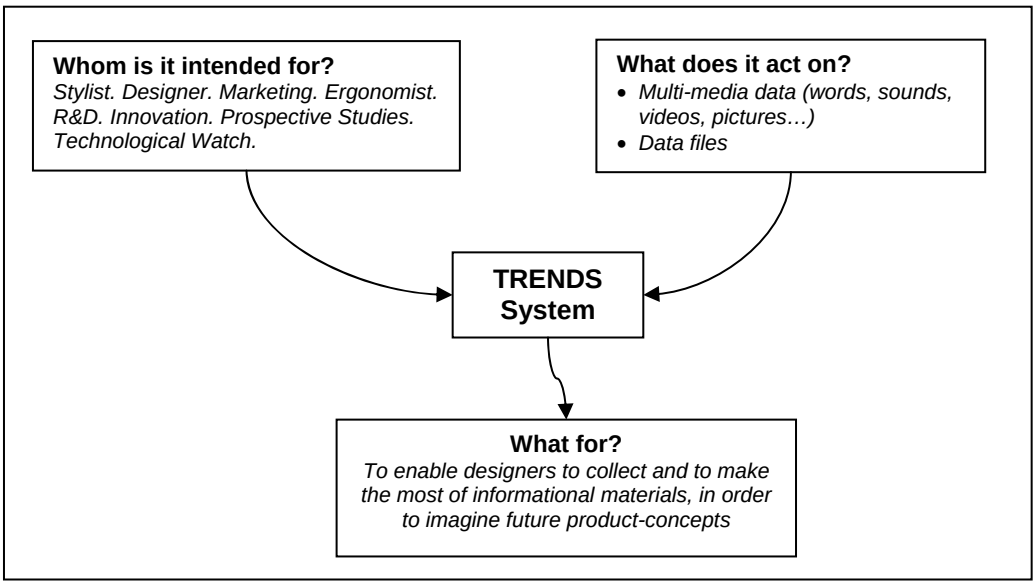

Fig. 5: TRENDS System Description

Tab. 1: Details of TRENDS system general description

What does it act on?	What for?
Data Visual data Pictures/photos Web Text Sound Video Multi-media data Numerical data Data about trends Colors/textures Design brief	To enable designers : - to collect and to manage information (1) - to get inspiration, to visualize (2) - to formalize (3) - to defend a project and to communicate (4)

3.4 TRENDS System Functional Description

The TRENDS system has to be described in terms of functionalities. This stage in the project enables us to make the transition between the end-users at Stile Bertone and Centro Ricerche FIAT and the project members in charge of the TRENDS system development. It is essential that all materials collected in the end-users interviews, in the state-of-the-art and in the market analysis are translated into verbal terms, which are meaningful to developers.

All information extracted from interviews, state-of-the-art and market analysis (table 1), were expressed in terms of functions and categorized into families.

The focus was on the "TRENDS system", which is represented in the center of a graphical system (figure 6). The participants then create links between categories and "TRENDS system", thus expressing a function by using 1 or 2 verbal terms.

Verbal terms: "Designer" + "End-users"

→ Function: "TRENDS system enables designer to identify current end-users needs"

Standard methodologies for functional analysis distinguish two types of functions for a system:

- Main functions :

They link two terms and the "TRENDS system".

*Ex.: "Designer" + "End-users" → "**TRENDS system** enables designer to identify current end-users needs"*

- Constraints functions :

They link one term and the "TRENDS system".

*Ex.: "Connection physical interface" → "**TRENDS system** has to be compatible with a connection physical interface"*

By using this methodology, we end up with 14 connections between TRENDS system and the verbal terms. The system can be described through four main functions (table 3) and ten constraint functions (table 4).

Tab. 2: Main Functions

A	To enable designer to get output data from physical and numerical resources, in order for her/him to imagine products-concepts of the future
B	To enable designer to collaborate with other designers and with decision-making workmates
C	To enable designer to store physical and numerical data
D	To enable designer to identify current end-users needs

Tab. 3: Constraint Functions

E	To fit car-design professional context
F	To respect media copyrights
G	To match information-processing standards
H	To be compatible with a connection physical interface
I	To stand up to external stresses
J	To be compatible with an external physical interface
K	To be compatible with the physical environment
L	To work well in harmony with users' current tools
M	To bring added value with respect to existing systems
N	To automatically update the whole numerical data

The resulting description is a quite exhaustive representation of the system, as follows:

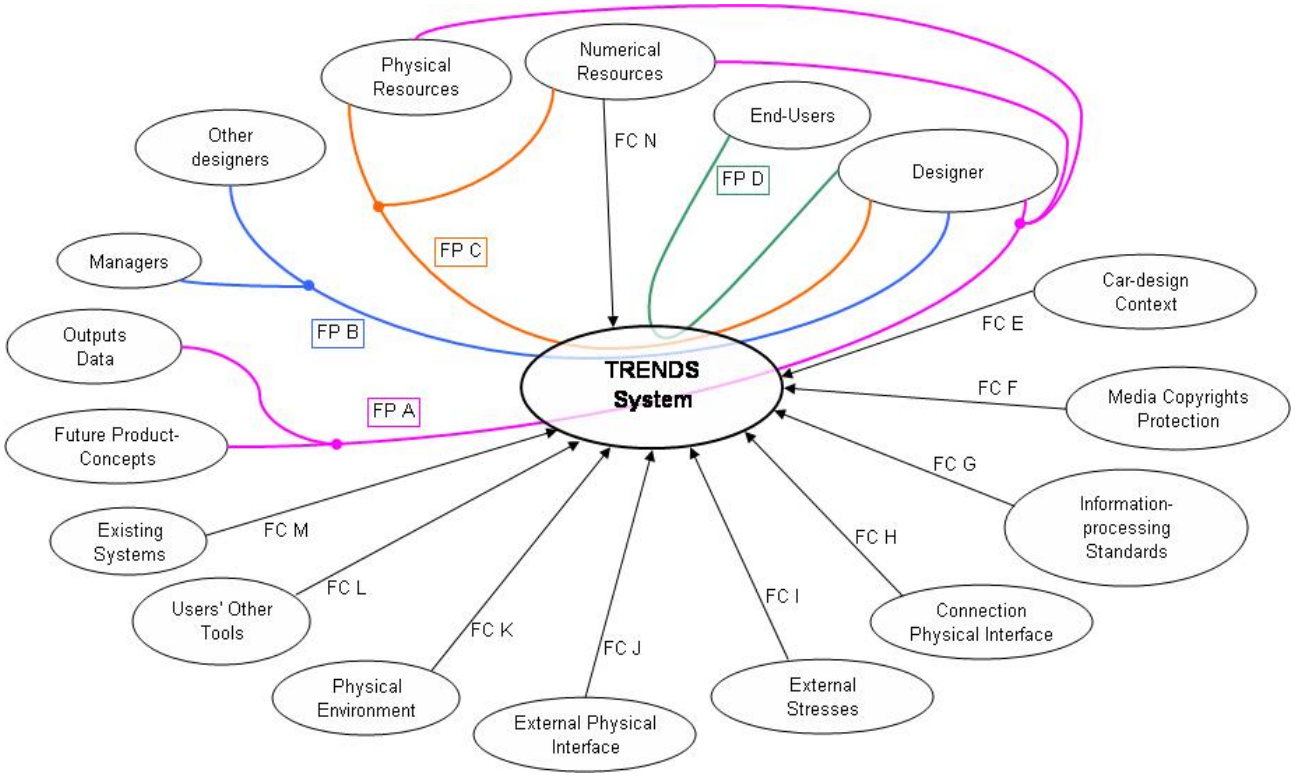

Fig. 6: TRENDS System Functional Description

The total of 136 items is allocated in that way (every items can be linked to several functions at a time):

Tab. 4: Number of items by sources and by functions

		Interviews	State-of-the-art	Market Analysis	total / function
Function A	*To enable designer to get output data from physical and numerical resources, in order for her/him to imagine products-concepts of the future*	26	53	20	99
Function B	*To enable designer to collaborate with other designers and with decision-making workmates*	3	9	4	16
Function C	*To enable designer to store physical and numerical data*	8	18	1	27
Function D	*To enable designer to identify current end-users needs*	2	9	1	12
	total / source	39	89	26	154

The complete list of detailed functions classified by Main functions is presented in Annex.

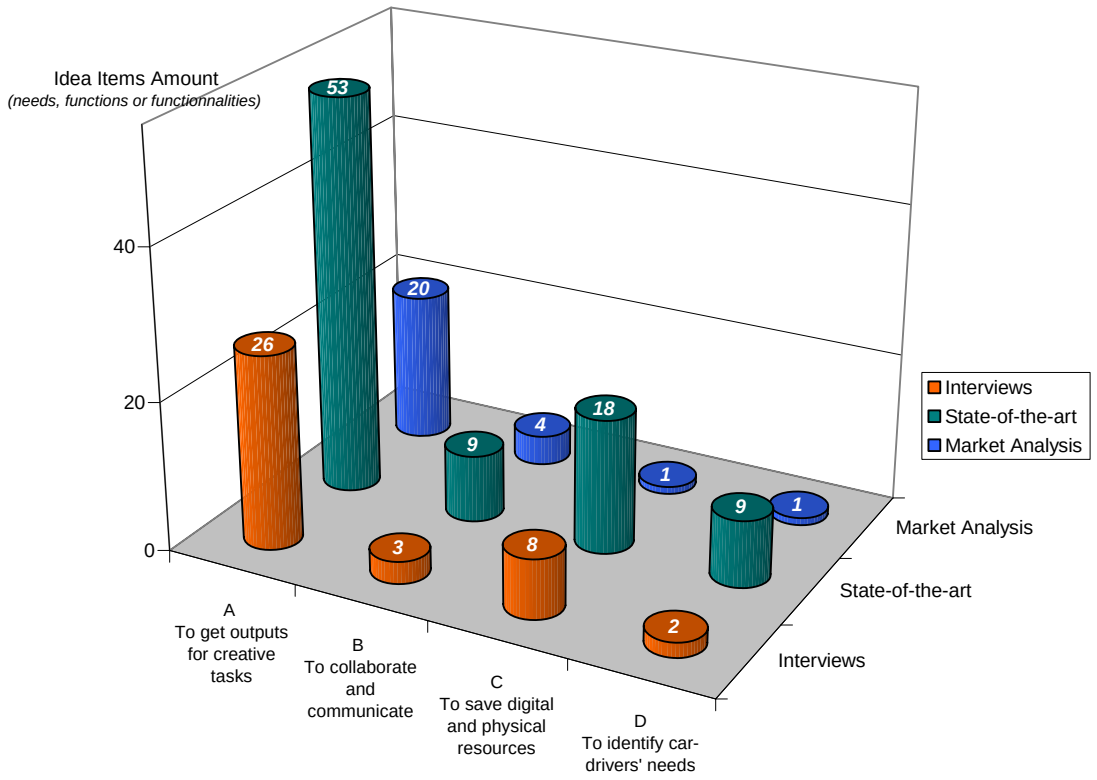

Fig. 7: Representation of sources inputs for each system main function

The quantitative repartition of the detailed functions (from D1.1, D1.2 and D1.3) into the Main functions of the functional analysis shows that inspiration for creativity was highly represented, especially in the state-of-the-art. It corresponds to the most significant function which was directly expressed by the end-users.

3.5 CRITERIA LIST BY TRENDS-SYSTEM DEVELOPERS

3.5.1 Protocol

In the phase of characterization (criteria definition), the TRENDS system developers were integrated. A specific functional characterization meeting was organized with SERAM-CPI Laboratory, INRIA and PERTIMM. The criteria of functions were expressed from the different point of views.

This meeting allowed TRENDS partners to develop a reflection space in order to analyze functions. The following figure schematizes the exchanges between partners.

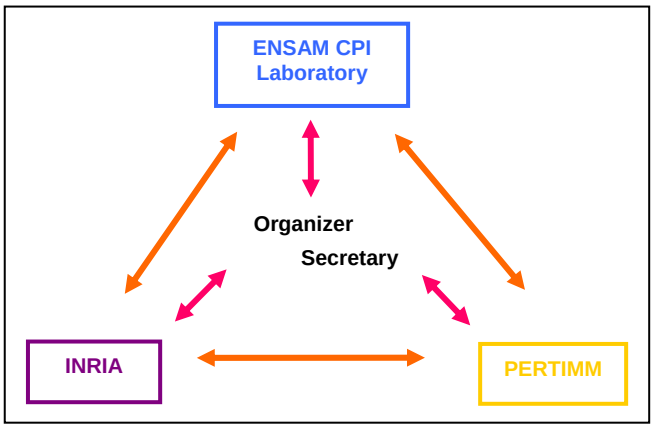

Fig. 8: Meeting Exchanges Organization

This session enabled collaborative work and provided the following advantages:

- definition of common references: explanation of ambiguous terms to computer-sciences partners (terms provided by the users' needs analysis),
- multi skills approach: interest of several points of view on functions,
- consideration of user needs : represented by SERAM-CPI laboratory,
- feasibility of enounced criteria: thanks to computer-sciences partners researches and experiences.

3.5.2 Technical Remarks

Several technical points emerged throughout discussions on the functional analysis.

Queries Computer-science partners want more detailed and precise information with regards to the possible queries designers may express. To create a future TRENDS system current research will be a valuable source.

Sound Research with regards to integration of sound into the system cannot be carried out; computer partners do not have relevant skills in this field.

Format Automatically retrieving images using web sites provides a huge quantity of data. However, automatic retrieval is incompatible with certain software (E.g. Flash) and some file formats (like ".PDF" format) cannot be extracted automatically.

Relevance The relevance of web sites can be automatically determined in two ways:

- by numbering the internal links of website to other sites,
- by numbering the external links to the website (the former mean being easier than the latter),
- by numbering relevant items density by paragraph (semantic relevance),
- by evaluating relevancy in images signature.

It is proposed by computer science partners to provide a reference database to users, where they can add their own websites. The users will also be able to add random results from the standard web searches.

Refreshing The reference database is essential since the system cannot explore the internet at each formulated query. This database will be refreshed according to the websites refreshing frequency (weekly, daily…). This database requires a server where favorite websites will be added gradually.

Social Values The trends extraction from "society" websites is an aspect to analyze. This is a major request from users; automation is technically possible however we currently don't know whether the retrieved information is relevant.

→ Assessment of meeting

Developing the criteria of functions was an important aspect of the functional analysis meeting. It was also important that the vocabulary of the functions was understood by all TRENDS project partners. Furthermore, this approach allowed, for the initial stages of the development of TRENDS system, to be based on user needs while taking into consideration the technical possibilities.

3.5.3 Results

As an output of the meeting between TRENDS-system developers, we got an insight of the functional requirements for TRENDS-system. Following a standard methodology for functional analyses, we collectively studied the meaning and the expectations behind every function of the system.

Every sentence describing a function was dissected, every team member giving his/her view about each term making functional description. So, every "function sentence" was described with many details, as shown in the "criteria" column of table 6.

The second step was to study the technical capabilities behind each definition that has been given in the "criteria" column, in order to consider the need, linked to the functional requirement, as being completed. This is shown in the "min. and max. levels" of table 6.

This table is actually a translation from users' needs to developers view.

Tab. 5 : Criteria and levels associated with every TRENDS functional description

Functions	**Criteria** Nature of descriptors for appreciating the way of a function to be fulfilled	**Min and max levels** Levels, under which or above which, the need is considered as not completed
Main Function A **To enable designers to get output data from physical and numerical resources, in order for her/him to imagine products-concepts of the future**	*Designers*: by field - Designers / stylists - Marketing - Technological Watch - Ergonomics - Innovation - R&D	Experience Level - novice / expert Age Gender Computer Skills Level Citizenship / Culture
	Designers: by project nature	Exploratory Advanced Phase Pilot Production Mass Production

	Physical Resources : - products - magazines[a] - journals - places - movies	Nature : Specialization Level Use Frequency / Impact Factor Issuing Frequency (freshness) Accessibility - eventually digitizable - access easiness - confidentiality level - cost
	Numerical Resources : - digital pictures - websites - videos : movies, commercials, clips - sounds / music	*Pictures / Images (/ Videos)* Formats - JPG, GIF, TIFF, PNG, BMP - PDF? File Size - Compressed with loss (JPG) - compressed without loss (GIF, TIFF, PNG, BMP) Dimensions (pixels quantity) - length x width : 200x200 – 12Mpixels Picture Quality - fuzzy zone - lights / contrast Picture Aesthetical Quality - professional pictures - news pictures - “artistic” pictures *Websites* Update frequency Longevity Site size Source Software (flash…) Text linked to the picture (caption, comments, meta-data …) External Links Sources Relevancy Level
	To get output data : Speed Request Type Relevancy / to search engine Usefulness - Relevancy / to end-user - Validation by end-user - Ground Truth (“vérité terrain”) Utilisability - Request is easily expressed - System Intelligibility - User-friendliness - Complementary to design-	 Interactivity: from 0 to 3 seconds Advanced Request : 3 sec and longer Pictures, sketches, text, mix of all, conceptual words / semantics

[a] Importance of PDF format

	job best practices Quality (cf. “Numerical Resources”) User Profile / Customization - Creativity gap between influence sectors	
	To imagine product-concepts of the future : Freedom to organize Output modularity Output data format	
Main Function B **To enable designer to collaborate with other designers and with decision-making workmates**	*To collaborate* : to communicate, to exchange, to defend ideas, to work collectively History / traceability - Statistical quantification Exchange Level Customization with respect to the data-receiving person (multi-tasks, multi-skills) Real-time / synchronicity Length of the traceability	
Main Function C **To enable designer to store physical and numerical data**	*To store* : Storage Duration Data Volume Confidentiality / security Customization of user’s database[b] - Adding own data (digital pictures, scanned images, text)	
Main Function D **To enable designer to identify current end-users needs**	*To identify current needs* : Major request from users (designers): feasibility? *End-users* = car-drivers, car-maker customers	Accuracy of the needs identification? Possibility of crossing sources? Multiple analysis (crossed)?
Constraint Function E **To fit car-design professional context**	Usage scenarios Users (=designers) tests Sectors of influence	
Constraint Function F **To respect media copyrights**	To respect laws - norms - copyrights Output data usage (eventually confidential)	

[b] Could the indexing be linked to the designer profile? Does it depend on the training? (by INRIA ?)

Constraint Function G **To match information-processing standards**	Not to create any new standard To make a list of information-processing standards	
Constraint Function H **To be compatible with a connection physical interface**	To use existing hardware and existing standards Requests / Interactions between subparts of the system	Network communication protocols (TCP/IP, Ethernet) Standard format (XML)
Constraint Function I **To stand up to external stresses**	To secure personal data [c] - logins, sessions, profiles/groups To avoid intrusions - firewalls - proxy	
Constraint Function J **To be compatible with an external physical interface**	External physical interface: screen, PDA Readability Graphical display quality	Current PCs of the market Current screens
Constraint Function K **To be compatible with the physical environment**	To respect the environment	
Constraint Function L **To work well in harmony with users' current tools**	To take into account trade practices TRENDS system to be complementary to pre-existing tools Added-value with respect to pre-existing tools	
Constraint Function M **To bring added value with respect to existing systems**	*Existing systems*: competitors software Performance Ergonomics Efficiency	
Constraint Function N **To automatically update the whole numerical data**	*To update* Durability Frequency *Automatically* : Should be transparent to the user	

3.6 FUNCTIONAL ANALYSIS VALIDATION

To validate the functional analysis that has been carried out, a “ranking questionnaire” has been sent to the end-users.

Results are presented in the next deliverable (D1.5).

[c] If wanted by users, ROBOTIKER is able to do it as integrator: different users’ profiles can be defined and maybe, it is needed to train the system for every groups, store the data parameters, and when entering the system, the related profile will be loaded, transferred from the interface to the search engine. This way, it won’t be necessary to train the system every time.

4. CONCLUSION

Previous deliverables D1.1, D1.2 and D1.3 presented the outputs from the interviews with TRENDS-system end-users, from the state-of-the-art of research on tools close to TRENDS-system and from a market study about existing tools close to TRENDS-system.

Those deliverables provided us with a list of around 200 items that were taken out of the reports by the design researchers. A functional analysis protocol was carried out, in order to structure the needs and to formalize the functional requirement for the TRENDS-system, based on end-users needs. We ended up with a list of main functions and additional functions to be found in the TRENDS-system.

In the functional analysis task, TRENDS-system developers participated by giving their view in terms of technical capabilities.

Finally, end-users were involved again in the functional description of TRENDS-system, since they had to rank the functional requirements according to their major expectations towards TRENDS-system. This ranking is shown as a validation for the functional specification and described in D1.5 report.

The main difficulty in this task was linked to the different languages involved: firstly the needs were expressed by the designers in their own language. Then they were sorted out in main categories according to the developpers language. It will be necessary during the next steps to keep in mind both point of views. The way for overcoming this complexity was to use specific efficient tools used in collective pluri-disciplinary contexts like the K-J method and the functional analysis method.

5. REFERENCES

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7. GLOSSARY

DESIGNERS

“Designers” are designers of TRENDS-system to be developed, i.e. European project partners.

END-USERS

“End-users” are end-users of TRENDS-system to be developed, i.e. people from design-related skills, coming from such departments as design, marketing or innovation.

FUNCTION

In design science, a function corresponds to the need to fulfill through the product. It is directly linked to the service to ensure and is enounced in terms of finality: “the new system has to enable to : ...”.

FUNCTIONAL CRITERIA

The functional criteria aim to characterize each identified function with a targeted quantitative interval where the system has to be positioned. Sometimes it is not possible to quantify the criteria of the system and it is useful to go through a qualitative description.