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D1.2 Agreed user requirements and scenarios v2.0

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Abstract	This document addresses the user requirements for the functionality that can be realized with the open source PuppyIR environment and is a re-submission of the original version of D1.2 reflecting the reviewer's recommendation that a section be added in which the scenarios selected for further development are specified (Section 5, Demonstrators). It starts with an analysis of user characteristics. In the next stage these characteristics are incorporated in realistic user scenarios, and these scenarios were the basis for the actual collection of user requirements. Finally a number of demonstrators are defined that will be developed in the course of the project to illustrate the possibilities of the PuppyIR environment.

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Executive Summary

This report describes the work carried out in Task 1.1 (Specification of requirements reference model and scenarios of use) and is a re-submission of the original version of D1.2 reflecting the reviewer's recommendation that a section be added in which the scenarios selected for further development are specified (Section 5, Demonstrators). Most of the technical work to be performed depends on this report; the dependencies with other tasks are listed in a separate annex (Annex B).

The work on the user requirements for the functionality of the open source PuppyIR environment was divided into three phases:

- analysis of user characteristics and providing a framework of relevant variables
- definition of user scenarios
- capturing the actual user requirements.

In this deliverable the procedures followed and the results of each phase are reported.

With regards to the end users, children, we distinguish three different age groups: 3-5 years, 6-9 years and 10-12 year. For each age group, the requirements framework will go into the specific characteristics with regards to language, computer and search skills and into the way in which children handle information. We also pay attention to the context in which they will be used in the PuppyIR environment: school, home, library, museum and hospital. Finally, we pay attention to the tasks for which it will be used: informational, educational, social, entertainment and consumer-interest.
The specific user characteristics, usage contexts and tasks are reflected in a set of user scenarios ranging from scenarios focusing on information seeking to scenarios with gaming aspects and collaborative elements. The scenarios were used to generate the user requirements for the kind of systems[1] that can be built from components of the open source PuppyIR environment, ranging from query, access and result presentation related requirements, to requirements related to the communication and collaboration functionalities.

[1] In the following, with "PuppyIR system" we refer to any system composed of components that make up the open source PuppyIR environment.

1 Introduction

The PuppyIR project addresses the way in which children look for and handle information. Children as information consumers however are not a coherent group: at different ages, their social, emotional and intellectual development as well as their physical abilities differ significantly. The project addresses three different age groups:

- 3-5 years;
- 6-9 years;
- 10-12 years.

Based on comparative study of these age groups we developed a framework of variables, covering different types of user characteristics that are important with respect to the way in which children deal with information. This framework of variables will be the subject of Section 2. The specific user characteristics are reflected in different user scenarios, presented in Section 3. There we describe how users could use services that are based on PuppyIR technology. In Section 4, these user scenarios are translated into user requirements, which will be the basis for the work in the other work packages and the development of the PuppyIR technology. In the Section 5 we will describe the demonstrators that will be developed to illustrate the possibilities of the PuppyIR framework.

2 Framework of relevant variables

Our work on user characteristics is based on the approach defined by John Carroll (Carroll, 1999): "Scenarios of human-media interaction help us to understand and to create systems and applications as artefacts of human activity – as things to learn from, as tools to use, as media for interacting with other people. Scenarios have the following characteristic elements: context, agent, goals or objectives and actions and events." Mainly based on desk top research we built a framework of variables[2] that can be of importance when developing information services for children. In this framework, we addressed four types of characteristics that can be compared to Carroll's scenario elements:

- user characteristics (agent),
- context characteristics,
- goals or tasks and
- system characteristics

Below we will go into the first three elements. The fourth element – system characteristics – will be dealt with in the section on user requirements.

2.1 User characteristics

Demographical characteristics

The demographical characteristics in the framework are kept simple. They are limited to the age and gender of the user group. The project is aiming at children in an age range between three and twelve. Within this age range there are considerable differences between children, partly due to the stage of development, partly to individual differences in skills, learning styles or intelligence. Children are classified within three different age groups; 3 to 5, 6 to 9 and 10 to 12 years old. These groups can roughly be compared to the cognitive developmental stages (Jean Piaget in Markopoulos, 2008): the intuitive thought stage, the concrete operational stage and the formal operational stage of development respectively.

Knowledge and language skills

Knowledge and language skills mentioned in the framework are reading skills, writing skills and spoken language skills. Children in the age of three to five years old only have basic language skills and learn to communicate mainly verbally. Their literate communication skills are based on picture books, image stories, logos and words (that they cannot read yet). Children of six to nine years old are beginning to advanced readers and writers. Children older than six years, however, still rely heavily on visual and auditory information. Language skills improve rapidly with children above nine years old. Both children with low and high language skills are considered important to be represented in the scenarios. For example, especially with regard to the youngest children, an information system has to deal with limited reading and writing skills.

Language

The languages for which content will be collected and tools developed are mainly Dutch and English, because these are the two most common native languages for the partners in the project.

Literacy skills and search skills

Literacy skills are related to the amount of computer experience and search skills. Within an age group there is a considerable variation in skills to formulate a query and navigation skills. The search activity

[2] See Annex 1 for the Framework of variables.

of a child might not be focused very strongly, and therefore a child might get lost in hyperspace very easily. Also extensive computer experience and familiarity with standard navigation tools should not be automatically assumed. Therefore, search and navigation skills are important to represent in the scenarios.

For example, Druin (2009) reports that children from six and seven years have very low search skills and children from eight and nine years have beginning search skills. They have a variety of information storage and retrieval strategies, but they can process it only with prompts or cues. Search skills grow rapidly with age. Around age eleven, Druin says, children's spelling begins to improve and they spontaneously use information storage and retrieval strategies (strategic processing skills), because they have more complex knowledge structures, and are better able to comprehend complex and abstract information.

Evaluation skills

It may be quite difficult for children to judge relevance, authority, reliability or recency of information. Young children tend to think everything is true; they consider whether information is useful and if it is about the desired topic, but they do not consider the quality of source or accuracy of information. That is why low evaluation skills should be represented in the scenarios.

For example, Walraven (2008) found that most used relevance criteria by young children are topicality, novelty and interest. They do not consider: language, authority, recency, truthfulness, accuracy and validity of information.

Affective states

Also, affective states of children may be of influence on their search behaviour, such as their motivation or emotions. For example, children that are intrinsically motivated might find information much more easily than children that are motivated extrinsically.

Physical states

Another type of user characteristics concern physical characteristics, such as motor skills, physical condition and physical functioning. In the scenarios, both children with low and high motor skills are represented. For example, children can have difficulties using a mouse, because they process information more slowly than adults. The smaller the object to be clicked on, the longer it takes for a child to click on it (Fitts in Hutchinson et al, 2005). Second, many children have difficulty with typing. They are not yet capable of typing without looking at the keyboard, termed touch-typing. Instead, they 'hunt and peck' on the keyboard for the correct keys (Borgman, 1995). That is why typing for children often takes a long time and can lead to frustration.

Considering the physical condition, both healthy children and children with an acute or chronic disease are represented.

2.2 Context

The physical contexts in the project are limited to the following common contexts for children: school, home, library, museum and hospital. All of these different contexts are represented in the scenarios. The context can also be related to the type of collaboration. Both physic and virtual collaboration with peers are represented in the scenarios, as well as a child working alone. Finally, also competitive interaction is represented in two of the scenarios (scenario 2a and 4).

2.3 Goal or task

The user group can have all different type of goals when searching for information; informational (get informed), educational (learn something), social (get contacts), entertainment and consumer-interest. All of these goals are implicitly or explicitly represented within the scenarios. These different types of goals can have different effects on information seeking-behaviour. For example, a child may be more

persistent in finding the right page when he or she wants to be entertained than when he or she has to learn something for school.

The origin of the task can also be of influence on the search behaviour of the child. For example, the child may be more motivated in finding information from his or her own interest or curiosity than in finding information for a task that is imposed by his parent or teacher. Both origins of tasks are represented in the scenarios.

Finally, the characteristics of the task may be of influence on the search performance of the child. Schacter et al. (1998), for example compared children's information-seeking on the internet on two tasks: well-defined tasks and ill-defined tasks. The well-defined task was a closed task and had a clearly defined goal in which the information necessary to solve the task was specified in the statement of the task. The ill-defined task was open ended: it had vague goals, a large number of open constraints requiring resolution, many possible solutions, and no clear directions for when to stop solving the problem.

The researchers found that the children searched more effectively on the ill-defined task than on the well-defined one. Well-defined tasks were difficult for children, because they require highly skilled analytic searching strategies. Ill-defined tasks were easier, because there are more potential answers to ill-defined tasks. They concluded that open-ended and loosely defined search tasks are well suited for children's internet searching. On the other hand, for tasks that are well-defined and highly specific, the internet may not be the most efficient resource to assist children with their information need. Schacter's research may be outdated, but illustrates that characteristics such as structure, abstractness and complexity of a search task may be of influence on the user's search performance.

2.4 Towards user scenarios

After the initial research on the framework of variables that might determine a child's information-seeking process, the work was directed towards the creation of realistic user scenarios in which these variables were reflected. During a workshop (June 5, 2009), the framework was discussed and fine-tuned. Also a ranking of the variables was proposed by determining which variables or instances are important to a lesser or greater extent to include in the scenarios for the research in PuppyIR (e.g. skills to evaluate relevance of information were ranked as more important than skills to evaluate authority of information).
Based on the framework of variables and the ranking of variables we were able to define realistic user scenarios, drafted by the different partners (EKZ, Museon and UT) and discussed during another workshop (June 26th, 2009). The target was to cover as many highly ranked variables as possible in the scenarios. Some of the original scenarios were dropped, others were modified.
To ensure the coherence of the work within the project during the workshop also the implications of the scenarios for the other activities work packages were discussed:

- The data that might be required to fulfil the scenarios (D1.4)
- The evaluation techniques that will be used to evaluate PuppyIR in relation to the scenarios (WP 5)
- Initial thoughts on the technologies from WP2 and WP3 that are relevant to each scenario.

3 User scenarios

In the previous section we described the results of the first stage of the process of capturing user requirements. The variables have been established that might determine the importance for children from different age groups searching for and processing information. These relevant variables were incorporated in realistic user scenarios that show how children might use the PuppyIR information services. In this section, these final scenarios that are the basis for our work on the actual user requirements are presented.

3.1 Scenario 1: Dino-Info-Land-Tool (context: school/home)

Scenario 1a: Jim's Dino-Info-Land-Tool (context: school)

Jim is 11 years old and he is in the classroom where the teacher has asked him to give 15 minutes talk about dinosaurs. Jim knows everything about dinos, their names, the period they lived, etc. He has a lot of books about dinosaurs. Unfortunately, most of his classmates have the same books as he. He really likes the assignment. He wants to give details yet unknown to his classmates in his presentation. He wants to start with a movie that he wants to construct from different kind of movies, and to give a short talk of forty minutes. Finally, he wants to give the floor to his classmates for using his Dino-Info-Land Tool. He wants to create an information cloud enabling his classmates to easily find their way through Dino-land. He has found an open source tool on Internet (called PuppyIR) with which he can create such an info world.

He has a book with a beautiful picture (see below) with some of the names of certain dinosaurs such as Tyrannosaurus Rex, also known as T-rex.
In his talk he wants to focus on the typical dinosaurs' research topics like fossils. Fossils are remains of prehistoric organisms. Preserved by burial under countless layers of sedimentary material, they are a record of the history of life beginning approximately 3.5 billion years ago, the study of which is called palaeontology. Jim wants to point out the places, the names of researchers and the research topics.

Jim knows how to use the Internet and is experienced with using internet tools such as Google, YouTube, MySpace, etc. The problem he has with the current applications is that he is not able to formulate a query properly (words like palaeontology) and the scientific language covering the research topics that he is looking for, is far too complex.

Jim is living in the Netherlands. His mother is from Glasgow, Scotland, so he speaks and reads English and Dutch fluently. He wants to use this advantage to impress the Dutch children with some new information from English sites, although it is not possible to present English spoken movies or text.

PuppyIR can help Jim in many ways. First of all, with PuppyIR Jim is able to have a vertical search on the topic of dinosaurs and can easily filter information that is easily to be understood by an 11 year old boy. PuppyIR includes also an expert finder with which he can find all the researchers who are

working on the various dino topics, in combination with places, facts, figures and pictures. With all the retrieved information he can easily build an interactive information world, enabling his schoolmates to add interesting stuff as well.

Important characteristics scenario 1a:	
Age:	10-12
Gender:	Boy
Reading and writing skills:	High
Navigation skills:	High
Search skills:	High
Domain knowledge:	High
Attitude:	Positive attitude
Motivation	Intrinsic and extrinsic motivation
Personality:	openness to experience
Motor skills:	High
Goals:	Educational
Subject:	school-related / hobby
Social interaction:	alone
IR tasks:	All (evidence combination models / expert finding / paraphrasing to form summaries)
Interfacing:	textual querying / images / movies

Scenario 1b: Dino's for young children (context: home)

Jim's little sister (five years old) hears about Jim's school project about dinosaurs. She also wants to know more about dinos. She will use PuppyIR to explore the dino world for young children.

Important characteristics scenario 1b:	
Age:	3-6
Gender:	Girl
Reading and writing skills:	None
Navigation skills:	Low
Search skills:	Very low
Domain knowledge:	Low
Attitude:	Positive attitude
Motivation	Intrinsic motivation
Motor skills:	Low
Goals:	Educational / entertainment
Social interaction:	Alone
IR tasks:	Exclusion / filtering
Interfacing:	Images / movies

3.2 Scenario 2: Learning from the exhibition (context: museum)

Both scenarios below are developed for a museum setting, which is a particular one. Visitors do not visit a museum explicitly for information. They primarily go there for recreation, and an overload of information may cause so called mental fatigue. Therefore it is the task of the scenario to closely link up with the exhibitions and to re-use information that is already in them. By offering a game-like approach they promote implicit learning.

Scenario 2a: Sustainability quest

Many museums offer quests to their young visitors. Usually such a quest leads them to certain exhibits about which a question has to be answered; the answer can be found on the object itself or for example on the boiler plate text. The scenario proposed here is in fact a reverse quest: the objects on display are not the starting point for the quest, but the target. We do not ask questions about objects, but we stimulate visitors to ask questions in order to find objects that meet specific criteria.

Fenia and Marcella both are 10 years old. They visit the museum using a portable device (internet tablet or smart phone). In the permanent exhibition *Your World, My World* an interactive quest is offered, focusing on one of the leading exhibition themes: sustainability. This quest establishes a relationship between the physical exhibition and digital information. The goal is to find specific objects that are on display.

Before starting, the girls set the level of adventurous of the game; the game can be tailored as to how adventurous and/or difficult it is.

- This quest starts with a conceptual map showing the main concepts of this permanent exhibition: rock, bone, sea, man, sun, struggle, god, art; these conceptual maps may use text and/or images.
- Fenia selects the concept ‘bone’ and on both devices related concepts are displayed.
- One of the exhibits that are related to this concept is about, the great tit (Parus major), a bird that is strongly affected by climate change. This exhibit is one of the goals of the sustainability quest, but of course the girls do not have this knowledge.
- After they select the concept ‘bone’, related concepts are displayed, not necessarily the same concepts on both terminals. On Fenia’s device these could be for example: bird, mammal, dinosaur, reptile or fish. On Marcella’s device the concepts could be: oak, leaf, bird or butterfly.
- Marcella selects the concept ‘oak’ and new concepts are retrieved: tree, nest, leaf, caterpillar etc.
- Fenia selects the concept ‘bird’, which is followed by related concepts like nest, feather, egg, to brood, etc. Note that a different selection in this stage may lead to a different goal; a different object in the exhibition.
- Since both girls are doing the same quest, they can discuss their concepts and combine concepts from both devices. In this way **collaboration** is stimulated. Each concept in fact represents a specific characteristic of an object on display.
- The final state of the conceptual map consists of images of objects on display from which Fenia and Marcella can select the relevant one. About this object information is displayed concisely, using terms from the concept maps: caterpillar, oak, climate, egg, etc. *“Young great tits are fed with the winter moth’s caterpillars. These caterpillars eat the young leaves of the English oak. Due to climate change these leafs sprout earlier each year. The caterpillars can find their food earlier each year and therefore cocoon earlier in the year, but unfortunately the great tit does not adjust the time to lay eggs.”*

Further notice
The quest could also be developed as a **competitive** one: who will be the first one to find the object on display? It also could be played with **only one** mobile device.
The aim is to keep the user in a constant flow experience and to enhance implicit learning. By integrating key objects from the exhibition in the quest, the visitor gets better hold of the exhibition’s narrative.

Important characteristics scenario 2a:	
Age:	10-12
Gender:	Girl
Reading and writing skills:	High
Navigation skills:	High
Attitude:	Positive
Motivation	Extrinsic
Motor skills:	High
Goals	Learning through flow experience, associative learning, learning through co-operation
Subject	School related, ecology
Social interaction :	Collaboration (or competitive)
Interfacing:	Tangible objects, text, images
Technology:	Pda / Smart phone

Scenario 2b: Interactive table to support associative thinking skills (context: museum)

The application serves as an introduction to the permanent exhibition of the museum, proposing the main concepts and storylines. It runs on an interactive table with a number of scale models or images representing key objects from the exhibition. By putting the objects on the interactive table, specific information is invoked, being text, image, sound or video. By combining objects the information is manipulated.

For example, a visitor puts the oldest rock on Earth on the table. Information about this rock is displayed, but also information on the origin of the Earth.
Than next to the rock a fossil of a fish is placed. Now information about this specific fossil is shown, next to the origin of life in the ocean.
Another visitor puts a coelacanth next to the fossil and information about so called living fossils is shown with some other examples from the exhibition. Or if the Allosaurus is put next to the fossil fish, information about extinction of species could be displayed. Someone puts a bird next to the Allosaurus and we will have a story of dinosaurs as the ancestors of birds.

Further notice
Other users can cooperate in the search, by adding information requests themselves, thus making the usage asynchronous. The tangible interface is expected to provide an intuitive way of learning associative thinking skills.

Important characteristics scenario 2b:	
Age:	8-12
Goals:	Learning through flow experience, providing an introduction to the exhibition
Subject:	School related, ecology
Social interaction:	Collaboration (sync)
Interfacing:	Tangible objects, text, images
Media types:	Text, images, sounds, video
Technology	Multitouch table, tangibles

3.3 Scenario 3: Finding books in the library catalogue (context: school, library)

Fatima (7 years old) visits the library with her classmates and teacher. When Fatima sees all the book stacks, she becomes nervous. She started learning to read a year ago, but she finds it very difficult to read and does not like to read. Reading and writing is even more difficult for her, because her parents do not speak Dutch very well and cannot read or write in Dutch at all. That is why they cannot help Fatima with her Dutch reading and writing.

Fortunately, the class passes all the book stacks and they enter an area with computers. Fatima's parents do not have a computer at home and Fatima only worked on a computer a couple of times at school to practice sums. She likes to practice sums on the computer, because she could earn 'coins' with every good answer and with these 'coins', she could pick out nice pictures that she could save on the computer. Last week, she earned the most coins from all of her classmates.

However, in the library today, they are not going to practice sums on the computer. The teacher tells them that they are going to practice how to find books in the library. Fatima is disappointed, because she does not like this exercise.

The teacher shows pictures of subjects to find books about in the library. The children use PuppyIR to find books. PuppyIR determines their age and language preference. In this case the language is Dutch. Besides a keyword search tool, PuppyIR offers categories represented by images with a text label, from which the children can select a category they think leads to the subject. The created taxonomy within the catalogue matches the taxonomies created by the children via the selected search paths. Fatima is not able to enter a keyword, because she does not know how to spell most words. However, PuppyIR also makes it possible to enter a query by presenting a picture of the subject as input to the system's user interface.

Selecting categories with a mouse is difficult for Fatima, because her motor skills are not yet developed well. Selecting objects with a mouse takes a lot of time, which is frustrating for Fatima. Therefore, PuppyIR offers other methods to select categories.

After finding the right topic within the catalogue, PuppyIR returns pictures of book covers of books about the topic that are suitable for the reading level of Fatima and her classmates. Fatima is not yet able to decide if books are really relevant for the subject and certainly not if the books that are returned are quality books. PuppyIR determines the relevance and quality of the returned books. When Fatima finds out she can find books about the subjects without having to spell the subjects, she starts to like the exercise. For every subject that she finds books about, she earns points by selecting the book she likes most and Fatima is determined to earn the most points from all of her classmates, just like she did with the math exercise.

At the end of the exercise the teacher says they can pick out a book from the selected books during the exercise, that they like most. PuppyIR provides an overview of all previous selected books and Fatima picks a book about cats, because she likes cats a lot and she would like to have a cat herself one day.

Important characteristics scenario 3:

Age:	6-9
Gender:	Girl
Reading and writing skills:	Low
Computer experience and navigation skills:	Low
Attitude:	Negative
Motivation	Intrinsic motivation increases by competition
Motor skills:	Low
Goal:	Educational
Subject:	School related
Social interaction :	Competitive
IR task:	exclusion / filtering
Interfacing:	textual querying / images / tangible objects/images (optional)

3.4 Scenario 4: John has Crohn's disease (context: hospital / disease)

John is an 11 year old boy who is admitted to the hospital and is just diagnosed with Crohn's disease, a chronic disease of the bowels. He speaks, reads and writes Dutch. Because his mother is from the UK he speaks and understands English but doesn't read or write it. He has a computer at home and uses it regularly for games but also for finding stuff on the internet.
He wants to know everything there is to know about Crohn's disease. He wants to know about other children with Crohn's disease and about their life with Crohn's Disease.

Scenario 4a: Looking for information about the disease

John uses Puppy IR to find information about Crohn's disease.
Further, Puppy IR can help John in several ways. Puppy IR determines his age and language preference, in this case Dutch.

Puppy IR gives John the possibility to choose between actions on the internet. He can choose between 'finding information', 'entertainment and 'meeting others'. These choices are represented by images, text or tangible objects.
John wants to find information. He can choose between various subjects. The subject that John selects is health & disease. The system helps him to decide the disease he wants information about. Via an image of a body and/or bowels as part of body or via body and possible symptoms he finds Crohn's disease. The system returns information about Crohn's disease, originating from quality controlled sites. The information is suitable for his age. All results are displayed on one page and test and pictures and videos are displayed separately on this page. Also it is clear what is text and what is picture and what is video. It is easy for John to select a result because below the link a short fragment of relevant text is displayed. When he selects a link only the relevant parts of the full information is displayed.
Somewhere on the screen, clearly visible is a meter that shows in a funny way how close he sticks to her original task/ goal. John clicks on a result but finds an interesting link that has nothing to do with his original task. The meter shows him that he is moving away from his original task. He does not want that and has the possibility to move back to the place where the meter showed that he was most close to the original task.

Scenario 4b: Sharing experiences

John uses Puppy IR to find other children with whom he can talk about Crohn's disease. Puppy IR determines his age and language preference. In this case Dutch. Puppy IR gives John the possibility to choose between actions on the internet. He can choose between 'finding information',

'entertainment and 'meeting others'. He chooses 'meeting others'. With a keyword ('Crohn's disease') or by finding the disease via images of a body and/or bowels as part of body or via body and possible symptoms, he finds Crohn's disease which he can use as subject for the chat with other children. Puppy IR returns Dutch websites where he can chat with other children about Crohn's disease or were he can ask a question about Crohn's disease to other children of his age.

Scenario 4c Entertainment in the hospital

During his admissions to hospital he wants distraction and wants to forget about being in hospital. He wants to be entertained and likes to watch funny video clips with animals and good jokes to tell his friends at home.

John uses Puppy IR. Puppy IR determines his age and language preference. In this case he likes to use Dutch when reading and writing but he is able to understand spoken text that is in English. He doesn't want to type on the keyboard but with the help of Puppy IR he is able to tell the system that he is bored and wants to be entertained. He tells that he especially likes video clips. His favourite subjects are jokes and animals and he tells puppy IR that he is in the mood for funny things. Puppy IR returns video clips that are suitable for a child of 11 years old, spoken language Dutch and English, only funny video clips with animals in it and good jokes.

Scenario 4d: Presentation at school about disease

After his admission John goes to school. Children in his class notice that he has to go to the toilet more than others and the toilet smells after John used the toilet.
His classmates make jokes about that.
He is scheduled by his teacher to give a presentation about a subject of his choice. John decides to tell his class about his disease so they will understand what the disease is about. Also it is a subject he thinks he knows a lot about. Also with better understanding of his classmates he hopes they are to treat him like before, like a normal boy. For his reading he wants to use a lot of pictures of the hospital, things in the hospital and his disease.

Important characteristics scenario 4:	
Age:	9-12
Gender:	Boy
Reading and writing skills:	High
Spoken language skills:	High
Text query formulation:	Keywords, spelling problems
Navigation skills:	High
Domain knowledge:	Relatively high
Attitude:	Negative at the start, positive in the end
Physical condition	Chronic disease
Motor skills:	High
Body posture:	No restrictions and restricted to bed
Goal:	Informational, social, consumer interest
Subject :	Health
Language:	Dutch, English (spoken)
Physical context:	Hospital
Social interaction:	Alone, with parents
IR tasks	Exclusion, filtering
Interfacing	textual querying, images, tangible objects (optional)

John uses Puppy IR. Puppy IR determines his age and language preference (Dutch). He communicates to Puppy IR that he wants to do a presentation for school. He also uses the keyword 'ziekte van Crohn' (Dutch for Crohn's disease). The system returns information (text) from quality controlled sites with general information about Crohn's disease in children. The language used in this

information is suitable for the reading level of John (according to his age) and all in Dutch. It also returns pictures and video clips on the subject that he can use for his reading. Besides that, the system returns general information about presentation at school and how to prepare a presentation. It also shows presentations from other children on the same subject. Because he also wants to tell about the hospital he repeats the search with the keyword hospital.

3.5 Scenario 5: Melody has diabetes (context: life with disease)

Scenario 5a: finding information

Melody is an 8 year old girl with diabetes. She needs to get daily shots of insulin to lower her glucose level. Her mother signed her in for a vacation in a diabetes camp. This is a camp where children with diabetes are educated about diabetes. Also they meet other children with diabetes. The camp is in Amsterdam. She doesn't know any of the other children that are going. It makes her a little afraid but also excited.
She wants to know everything there is to know about the camp.

Puppy IR determines the age of Melody and her language (Dutch). She knows it is a camp for children with diabetes and knows it will be held in Amsterdam. She doesn't know how to get started. Puppy IR helps Melody to determine the purpose of her information search. The system determines it has something to do with diabetes and something with vacation. Also that Amsterdam has something to do with that. Before returning results the system asks what results Melody is interested in: text, pictures or video. The system returns information about vacations with diabetes in Amsterdam for children. It is information suitable for a child of 8 years old, only a few results are presented sorted by kind of vacation. She is able to pick out the camp in Amsterdam. By clicking on this result she gets all the information there is about the camp. This includes a description of the camp and lots of pictures.

Scenario 5b: meeting other children

Melody wants to meet other children that have been to a diabetes camp.
Puppy IR determines the age of Melody and her language (Dutch). She can point out to the system that she wants to meet other children on the internet. She can also show puppy IR that she want to meet other children with diabetes of her age. Puppy IR leads her to websites for children where she can meet other children with diabetes and with the possibility to talk online or leave messages. She leaves a message.

Scenario 5c: looking for trade

Melody is packing for camp. She wants to know what gadgets there are for children with diabetes. Puppy IR determines the age of Melody and her language (Dutch). She lets Puppy IR know that she is looking for something to buy. Puppy IR determines her location. She now can choose subjects/ categories of things she is looking for. In this case she is looking for something related to her health. The system helps to exactly establish the health problem, in this case diabetes. It returns stuff that can be bought on the Internet that have something to do with diabetes. Of all items prices are ranked. Melody’s search is saved and later she returns to her final choices with her mother who buys the gadget she wants to have.

Scenario 5d: looking for trade

Before going to camp she is celebrating her birthday at school. She wants to bring a treat for the other children. She is very angry and frustrated that she is not allowed to eat a lot of the most popular treats.

She uses Puppy IR to look for treats that she can bring. PuppyIR allows Melody to tell what mood she would like to be in. In this case happy. She lets Puppy IR know she is looking for something to eat and

she lets it know it has something to do with school. After this she can also point out that there is a diet to consider: in this case without sugar. She can choose between several categories of food. All things that are returned tasteful, nice (happy) coloured, fun shaped foods. It helps her to choose a treat for her classmates.

Scenario 5e: searching for help

On camp Melody learned a lot about diabetes but also the complications of diabetes. It made her very afraid. But she doesn't know how to talk about her fear with her parents.

She uses Puppy IR and shows it that she is afraid. Also she shows Puppy IR that she wants to be less afraid. Also she shows Puppy IR that her fear has something to do with diabetes. Puppy IR returns results about diabetes and fear, especially results that deal with decreasing fear.
Also her parents can look at her search, see that she is afraid about something to do with her diabetes. It helps them to talk about that with their daughter.

Important characteristics scenario 5:	
Age:	6-9
Gender:	Girl
Reading and writing skills:	Intermediate
Spoken language skills:	High
Text query formulation:	Keywords, spelling problems
Search skills:	Low
Navigation skills:	Intermediate
Domain knowledge:	Relatively high
Attitude:	Positive
Emotions:	Fear, anger
Motivation:	Intrinsic
Physical condition:	Chronic disease
Motor skills:	High
Body posture:	No restrictions
Goal:	Informational, social, consumer interest health, consumer interest
Subject :	Consumer interest
Language:	Dutch
Physical context:	Home
Social interaction:	Alone
IR tasks	Exclusion, filtering, document retrieval
Interfacing	textual querying, images, tangible objects (optional)

4 Defined user requirements

Within the PuppyIR project we deal with three different types of user requirements:

1. Requirements coming from the end users, this means children;
2. Requirements as defined by the information providers;
3. Technical requirements

Within the scope of this document we will cope with the first two requirements categories. The third category will be dealt with in Task 1.2 (and described in D1.3 Agreed technical requirements).
The work on the user requirements was based on the final user scenarios. The individual content partners, EKZ and Museon, and UT drafted the first versions of the user requirements. These drafts were aggregated and discussed during two telephone conferences. These conferences led to a final draft, presented to the full consortium on October 5th and 6th in Madrid. The outcome of this meeting was the consolidated user requirements as reflected in this document. The responsibility for the translation of the user requirements in functional specifications was divided amongst the different workpackages and partners.

4.1 General requirements

User profiles

A PuppyIR system should take into account different characteristics of the user:
1. Age
2. Gender
3. Language preference for text output. It should be possible to limit the search results to one or more specific languages, in any case Dutch and English.
4. Language preference for speech output. It should be possible to limit the search results to one or more specific languages, in any case Dutch and English
5. The specific goal of the search, e.g. preparation of a presentation, being entertained, etc.
6. Reading level, measured by AVI (Analyse van Individualiseringsvormen) in the Netherlands or DRA (Developmental Reading Assessment) in the UK**.**

and optionally:
7. Current mood: bored, happy, angry, etc.
8. Desired mood: happy.
9. Context of use (e.g. home or public space)

Ease of use

The user interface should be easy to use in a way that an additional help function will not be necessary.

4.2 Access related requirements

Accessibility standards

A system created from components of the PuppyIR platform should comply with the accessibility standards defined by the Web Accessibility Initiative (WAI) that are applicable to children as end users.

Multimodal input

A PuppyIR system should support multimodal input:
1. Keyboard
2. Mouse/pen
3. Touch

and optionally:
4. Tangible objects
5. Movement
6. Gaze

Internet and standalone

It should be possible to build PuppyIR systems for internet or standalone computers.

Devices

It should be possible to build a PuppyIR system that is accessible via different devices:
1. pc
2. multitouch devices
3. mobile devices

4.3 Query related requirements

Different search methods

The user should be able to choose between different search methods, at least the following:
1. It should be possible to search using keywords.
2. It should be possible to search using natural language.
3. It should be possible to search by topic, organized using a simple taxonomy of topics.
4. It should be possible to search by means of images that represent specific keywords. An example of this is an image of a body that can be used to find the health/disease subject of interest, with possible symptoms for body parts.

and optionally:
5. Based on a user entered query PuppyIR should be able to propose examples of queries that can help the user in his search (suggest queries).
6. It should be possible to search by presenting a tangible picture or object to the PuppyIR user interface.
7. It should be possible to start a search using tangible objects. It should be possible to change the query by combining different tangible objects.

Media types

A PuppyIR system should be able to search for different types of media (text, image, video etc.), potentially at the same time:
1. Text
2. Image
3. Video

and optionally:
4. Rich media (animation, Flash etc.)
5. Speech and sound

Helping to build a query

The user should be helped by the PuppyIR user interface building a query:
1. It should be possible for the user to choose between different actions on the internet, such as finding information, finding persons, finding book titles, entertainment, meeting others, buying stuff, or a combination of different actions .
2. The user should get help determining the exact purpose of the information search.
3. PuppyIR should be able to cope with misspellings.
4. PuppyIR should be able to work with alternative keywords for a keyword entered by the user.
5. PuppyIR should be able to retrieve those parts of documents that help children formulating their queries better and help them by focusing their search by clicking on categories and suggestions, organized along Who, Why, What, Where, When, within those categories.
6. The user should have the possibility to choose whether a PuppyIR system should recognize and take into account specific types of media (text, image, video etc.) or all media at the same time.

4.4 Result related requirements

Result set management

It should be possible to save a query and its results:
1. It should be possible to save a query.
2. It should be possible to save the results of a query.
3. It should be possible to save the personal selection from the search results
4. A PuppyIR system should be able to enlarge the user's knowledge by offering similar or analogous concepts or topics: the system should propose subjects or concepts that might also interest the user.

and optionally:
5. It should be possible to save the history of the search session.

Search environment

A PuppyIR system should offer an engaging, effective and safe environment for children in their information seeking activities, preventing them from being exposed to materials that are inappropriate for their developmental stage.
1. A PuppyIR system should be able to verify the results of a search; to ensure the quality only results from verified sources should be returned.
2. The results of a search should meet the specific user characteristics - see requirement 1.

and optionally:
3. A PuppyIR system should advise children on the polarity of opinions, and address neutrality when for example providing explanations.

Presentation of results

A PuppyIR system should support different ways to present the results of a search:
1. It should be possible to choose between different presentations of results: text, image, combined.
2. A PuppyIR system should be able to present results of a search on a single page.
3. A PuppyIR system should be able to aggregate and present information from multiple searches in a single information unit.

Working with results

Tools should be available, helping the user to access, manipulate and structure the results of a query:
1. Browsing through the search results there should be an indicator that shows how close the user sticks to the original research purpose. It should be possible to move back to the place where the indicator showed that the user was closest to the original task.
2. When a specific result of a search is selected by the user, only that information from a resource is displayed that is directly relevant to the question asked.
3. The user should be able to manage a personal selection from the initial search results.
4. The user should have different options for presenting selected information, e.g. an information cloud[3].
5. It should be possible to send this structured personal selection to a friend.
6. It should be possible to co-operate on such a personal collection of search results.
7. A PuppyIR system should be able to group search results into different categories like places, people, facts, figures, images en videos.

and optionally:
8. If the user has reached the goal of the search, the system should be able to give suggestions for further action. For example, if the search purpose was the creation of a presentation, this could be a reference to existing presentations about the same subject. If finding information about a disease was the purpose of the search, this could be information about products for children with a specific disease.

4.5 Information manager related requirements

Restriction of resources

It should be possible to restrict the results to moderated sources. Information managers should have tools available to record sources that they consider as reliable. Information moderators should have tools available that help them managing their collection of data.

Data entry

1. A PuppyIR system should provide the information manager with tools for entering new information. This information can be text, image, video, sound, rich media but also links to information.
2. It should prevent an information provider from having to enter information more than one time.

4.6 Social networking

A PuppyIR system should support interaction between different users, e.g. between children having the same disease or children having the same purpose for searching.

[3] An information cloud (or weighted list in visual design) is a visual depiction of information, used typically to describe the content of a website.

Collaborative searching

A PuppyIR system should enable collaborative searching and interaction by providing interfaces that support group working.

Stimulating collaboration

A PuppyIR system should stimulate contacts between persons (e.g. parents and children, peers)

Interfacing with existing social networks

A PuppyIR system should be able to interface with existing networks for online communication and collaboration for children.

4.7 Other requirements

Conceptual maps

1. A PuppyIR system should support conceptual maps (2a), by means of feedback helping a user to get to a specific location.
2. A PuppyIR system should support some data entry for the construction of conceptual maps.
3. It should be possible to show a conceptual map on a single device, but it should also be possible to show related conceptual maps on two different devices.

5 Demonstrators

Based on the scenarios, a number of demonstrators was defined that will actually be built to show the possibilities of the PuppyIR framework. These demonstrators are related to a museum and a hospital setting.
Starting point for the definition of the demonstrators was their applicability in the museum and the hospital, ensuring that they will not only be developed for laboratory situations but become available for their real target users.

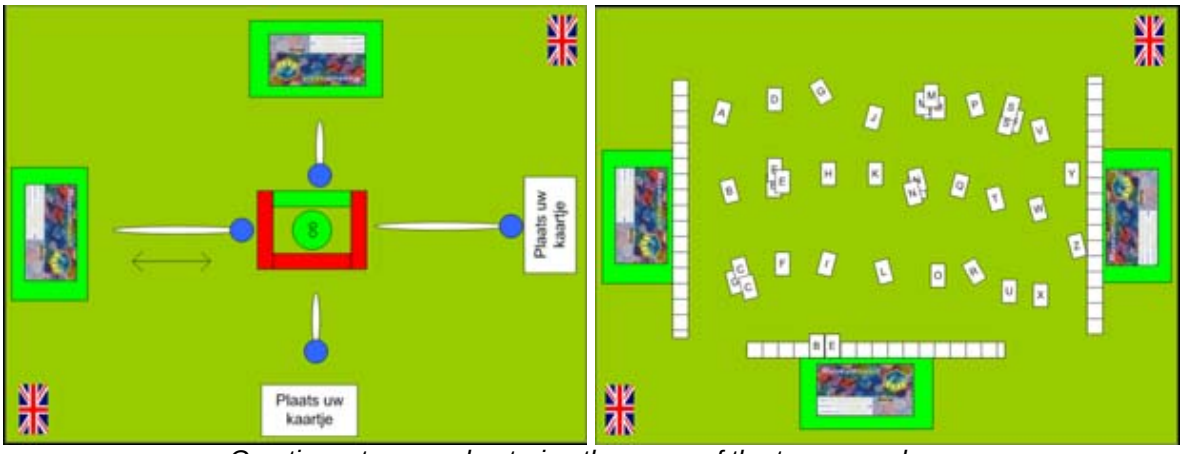
5.1 Collaborative quest

Many museums offer quests to their young visitors that lead them to certain exhibits about which questions have to be answered. The answers can be found looking at the object itself or for example on the boiler plate text. Usually these are individual quests offered on paper.
The scenario proposed here is different in two aspects: the quest is offered in a digital way, offering the possibility to give live feedback, and is played by groups of visitors. In this way this demonstrator will combine aspects from both museum scenarios 2a Sustainability quest and 2b Interactive table. The handheld devices from scenario 2a are replaced by terminals with barcode scanners that are part of the existing museum's infrastructure, while a multitouch table is added to the quest.
The functionality of the quest will be developed outside the PuppyIR project. PuppyIR focuses on the applications for the multitouch table, where the focus of the work is on collaborative interfaces.
The quest, named *Exhibition Museon*, will be developed for teams consisting of 2 to 4 persons, starting and ending at a multitouch table. The purpose of the quest is to collect objects in the exhibition for an end game and to reach a score that is as high as possible. With the game we want to stimulate interaction between visitors and between visitors and the physical exhibition.

The start at the table has different purposes:

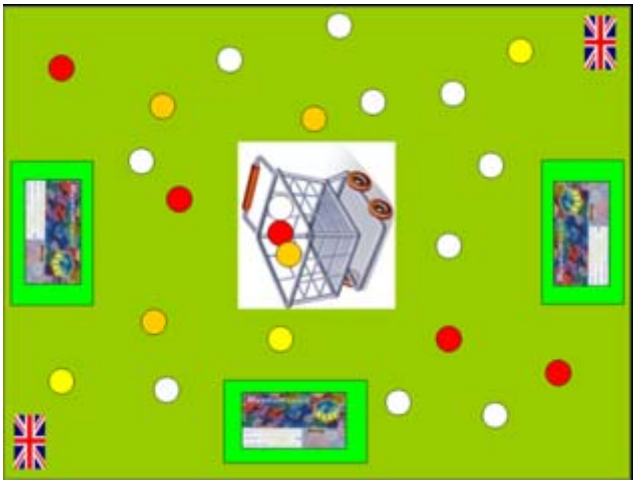
- Activating the barcodes to be used at the terminals in the exhibition;
- Making a group out of the individual players;
- Selection subjects that should be part of the quest.

The entry ticket contains a tag, that can be recognized by the multitouch table and that corresponds to the barcode that is also printed on the ticket and can be read by the barcode scanners in the exhibition.
Entering the exhibition a group of users put their tickets on the multitouch table, and on the screen it is asked whether they want to participate to the collaborative quest.



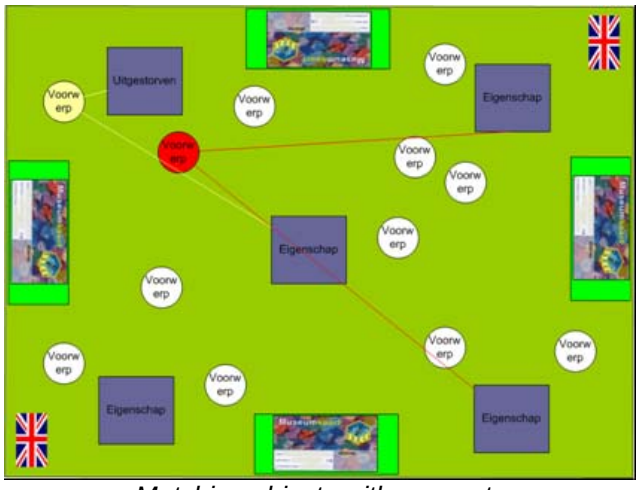
Creating a team and entering the name of the team members

After they confirmed this question they fill in their names. As soon as they are finished, the function of the table changes and some dozens of images representing different exhibition subjects of appear. This enables the team to select the subjects that they are interested in and that they want to be incorporated in the quest. Now they are ready for the actual quest.



Determining the contents of the quest

After the barcodes are activated, the team is formed and the team members have decided upon the contents of the quest, they visit the actual exhibition. For each team member there are 12 questions that are displayed on the exhibition terminals after scanning a barcode. These questions are generated from a database on basis of group preferences. Each group member gets different questions about the same subject; in fact they all deal with different aspects of the same subjects. In this way co-operation and exchange of information between team members is promoted.
After each subject the team can select a related object to be taken with them to the end game at the table. Having collected in this way 12 objects in total the team is invited to return to the multitouch table. There the objects are displayed, together with *concepts* that are relevant for the set of objects. The purpose of the endgame is to connect as many as possible objects with as many as possible relevant concepts, e.g. concepts related to the object dinosaur might be: fossil, extinct, bird.



Matching objects with concepts

For every correct match between an object and a concept points are deserved, to be added to the points that are deserved during the quest. High scores are listed and displayed by the system.

5.2 Interactive table

Another museum demonstrator is strongly based on scenario 2b Interactive table to support associative thinking skills. Starting point for this demonstrator are the objects that are on display in Museon's permanent exhibition *Your World, My World,* providing information about subjects from the natural history, history, technology and ethnology domains. The application allows children to search through the exhibition's content. On one hand it serves as an introduction to the exhibition and could be used inside but even outside the museum, for example at events where the Museon is represented. At the other hand it could serve as a way to deepen the knowledge of the exhibition contents available after the actual visit.
Central in the demonstrator there are key objects from the exhibition, to be displayed on a multitouch table. By combining the objects one to another or by combining them with specific concepts (man, nature, origin, etc.) information is retrieved, from the museum or from the web. This information can consist of related objects from the exhibition (text and image) or information with a more contextual character, being text, image, and video from the museum information repositories or web pages, providing background information about the objects. In this way we allow visitors to dig into the contents of the exhibition, which will be enriched with local and worldwide information on a children's level.

5.3 Hospital's information retrieval system

The information centre of the Emma Children's Hospital AMC (EKZ AMC) is a specialized information centre that was founded in 2004. It was introduced as a patient information centre where paediatric patients, their parents, their relatives, healthcare professionals and other persons and institutions (for example school) involved with the patient can ask questions about all aspects of disease, diagnostic procedures, treatment and social aspects and implications. The information centre is situated in the paediatric clinic but is also open for requesters from the paediatric outpatient clinic, other non-paediatric departments of the EKZ AMC and requesters from outside the EKZ AMC.
The core of the centre's activities is in the question-answer service. The information centre is open for questions four days a week. Questions are asked by visitors, by telephone, by e-mail or in writing. Every requester gets personal help to find the answer to the question asked. For children a special service is provided for the preparation of school papers and presentations.
The information sources used in the information centre are paper and digital information brochures from the EKZ AMC and other organisations. The information centre has its own book collection with medical books for non-professionals and children, a special online CD-rom with quality controlled medical, legal en social patient information developed by the national information centre for care, social security, law and legislation and well-being (ZWCD-online: 2zw.host.diskad.nl), magazines from patient organisations, its own website (www.amc.nl/emmainfotheek) and medical literature. For children a special service is provided for the preparation of school papers and presentations. Also there is a special collection of books about disease, the human body and hospitals and brochures developed for children by the information centre.
Analysis of the question-answer service showed that parents are the main group to ask questions to our information centre. Patients on the other hand are only a minority (5.1%) of the requesters. This is mostly because most of our patients are young children: of a total of 7,621 admissions and 13,085 first consults at the outpatient clinic respectively 5,648 (74.1%) and 8,774 (67.1%) were under the age of ten. Unfortunately, only few of the older patients (over ten) visit our information centre by themselves, many of them (33.3%) only gathering information for a school presentation about their disease or some other hospital related subject.
Possible explanations for the relatively low number of patients visiting the information centre include:

- patients are mainly informed by their parents;
- patients are not interested in more information, for example because of insufficient connection to their daily reality, like school and other child activities;
- parents did not pass on the information they received about the centre to the older children;
- The threshold for children to visit the information centre is too high.

For the definition of the hospital's demonstrator we used the scenarios from chapter 4 with the general requirements and technical requirements as a starting point. The focus was on aspects of scenario 4 and 5, but requirements can also be mapped to aspects of other scenarios. The information is transformed to better match the local situation and to hoop up with the extensive renovation that the Emma Children's Hospital is currently undergoing. All paediatric wards are renewed and after the

renovation all beds will have a personal computer (Interactive Multimedia PC for Hospitals). The renovation will be completed in 2013 but already in the years before several wards will be finished. The information centre wants to use these computers as an access for children to the information of the information centre (and to information for children on the internet) and facilitate social relations between patients and their friends, classmates and contact with fellow sufferers. We can summarize our goals as follows:

- improve information about the existence and possibilities of the information centre for children,
- improve the accessibility of the information centre and its information content for children, and
- expand the information content with reference to more extensive information on the internet that is suitable for children.

5.3.1 Research questions

- Does the use of the Puppy IR demonstrator by children (admitted to the hospital) increase the knowledge about their disease?
- What is the influence of the use of the Puppy IR demonstrator by children (admitted to the hospital) on the number of questions of children to the information centre?
- To what extent is the information centre able to expand her information content with use of the demonstrator?
- What is the association between relevance of information and the extent to which children are satisfied with the information?
- What is the difference between relevance of information judged by adults/ health care professionals and the relevance judged by children?
- What is the search interaction behaviour of children searching for medical information?

5.3.2 Detailed description of the EKZ demonstrator

The demonstrator is accessible via the Interactive Multimedia PC for Hospitals that will be available at every hospital bed after the renovation.
The demonstrator will focus on the age category 10-12 years (intermediate and good reading capabilities), but the age category 6-9 years (low or no writing and reading capabilities) will not be excluded.
The focus will be on questions about disease, the hospital and human anatomy (general and specific parts) and school presentations and papers.
The demonstrator offers the possibility to search with images and text. The demonstrator offers query assistance. The child is offered suggestions for narrowing down (for example if the child wants to know about the heart, the system offers suggestions like diseases of the heart, what does the heart look like, operation of the heart) but also suggestions for combining with other possibilities, for example a child that asks about a specific disease is gets the suggestion to do a school presentation about this subject.
The environment will be a combination of an open and moderated environment with content approved by the information centre (children books, images, movies, children brochures, and websites). It must be clear to the child if he/she is searching in a moderated environment or the rest of the web.
Search results are suitable for the specific age. For the younger group focus is on non-text based results. For the older group both results are returned. The information is shown as a collage of possible media types (colouring page, picture/ anatomy, text, etc.) from which the child can choose. Search results are presented on one page. Where text from websites is presented these are only the relevant parts. Only text of children's websites and webpages are returned.

6 Conclusion

Between the different age groups at which the PuppyIR environment is aiming – 3-5 years, 6-9 years and 10-12 year – there are, of course, considerable differences, strongly related to the physical, social, emotional and intellectual development stages of humans. The specific characteristics of these age groups are reflected in a number of user scenarios:

- Children that use components of the PuppyIR environment to search for information related to dinosaurs and to prepare a presentation about this subject.
- Children that visit a museum guided by a quest generated through the PuppyIR framework.
- Children who are prepared to visit a museum by means of a multi-touch table on which information is shown that is retrieved via PuppyIR.
- Children in a library that are helped searching for books via PuppyIR.
- Children in a hospital that use PuppyIR to be informed about their disease and to be entertained.
- Children with a chronic disease who use PuppyIR to organize their life with disease and to meet others with the same disease.

These scenarios made it possible to capture the user requirements for components of the open source PuppyIR framework, ranging from query, access and result related requirements to requirements related to communication and collaboration.

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Annex A: Framework of variables

Keys:
- Ranking of importance for scenarios: 0 = no, 1=perhaps, 2=nice-to-have, 3=need-to-have
- Scenarios: E = represented explicitly in scenario, I = represented implicitly in scenario

Variables	Instances	Ranking of importance		Scenario 1a	Scenario 1b	Scenario 2a	Scenario 2b	Scenario 3	Scenario 4	Scenario 5
User characteristics										
Age	3, 4, 5	3			E					
	6, 7, 8, 9	3					E	E		E
	10, 11, 12	3		E		E	E		E	
Gender	boy	3		E			E		E	
	girl	3			E	E		E		E
Knowledge and language skills										
reading	low	3			E			E		
	high	3		I		E			I	
Writing	low	3			I			E		
	high	3		I					I	
spoken language skills	low	3			I					
	high	3		I				I	I	I
literacy skills										
Computer experience	high	3		E		E			I	
Search skills										
Text query formulation	not able	3			I					
	key words	3							E	E
	natural language	3		I						
	spelling problems	3						E	E	E
Translation information need to query	low	3		I	I			E		E
	high	3							E	

Variables	Instances	Ranking of importance		Scenario 1a	Scenario 1b	Scenario 2a	Scenario 2b	Scenario 3	Scenario 4	Scenario 5
Navigating skills	low				I			I		
	high			I					I	I
Focus / not get lost in Hyperspace skills / self regulation	low				I			I		E
	high			I					I	
Associative search abilities	low				I			I		
	high			I					I	
Evaluation skills / critical thinking skills		3								
evaluation of relevance	yes			I						
	no				I			E		
Authority	yes			I						
	no				I					
reliability / accuracy / quality	yes			I						
	no				I			E		
Recency	yes			I						
	no				I					
Affective states										
motivation / drive	intrinsic	3		I	I			I	E	E
	extrinsic	3		I		I		I	E	
emotions / mood	low arousal (excitement, intensity)	3								
	high arousal	3		I	I			I		E
	low valence (appreciation, quality)	3						E		E
	high valence	3		I	I					
	extraversion (Hamburger,2000)	3								

Variables	Instances	Ranking of importance		Scenario 1a	Scenario 1b	Scenario 2a	Scenario 2b	Scenario 3	Scenario 4	Scenario 5
	Neuroticism	3								
	Openness to experience	3		I	I					
	Agreeableness	3								
	Conscientiousness	3								
Physical states										
Motor skills	high	3		I		E	I		I	I
	intermediate	3								
	low	3			I			E		
Physical condition	healthy	3		I	I	I		I		
	acute disease	3								
	chronic disease	3							E	E
	life threatening disease	3							E	
Physical functioning and participation (not age related)										
Manipulating (like keyboard)	no impairment	2		I	I			I	I	I
	light / intermediate impairment	2								
	severe / full impairment	2								
Body posture	no restrictions	3		I	I			I	I	I
	is able to sit in (wheel) chair or bed	3								
	Needs to lay down in bed	3							E	
Language										
	Dutch	3		E	E			E	E	E
	English	3		E	E				E	

Variables	Instances	Ranking of importance		Scenario 1a	Scenario 1b	Scenario 2a	Scenario 2b	Scenario 3	Scenario 4	Scenario 5
Context										
Physical context	library	2						E		
	hospital	3							E	
	museum	3				E	E			
	school	3		E				E	E	
	home	3		I	E					E
Collaboration	Physic	3					E	E		
	Virtual	3								
	alone	3		E	E				E	E
	with peers	3				E	E	E		
Goal or task										
Goals	informational (collect info to get informed)	3							E	E
	educational	2		E	I	E	E	E		
	social (contacts)	3							E	E
	entertainment	3							E	
	consumer-interest	3							E	E
Subject	health	3							E	E
	hobbies	3		E	I					
	school related	3		E		I		E	E	
	ecology	3				E	E			
	consumer-interest	3							E	E
Origin of task	own interest / curiosity	3							E	E
	imposed by adult (not educational)	3								
	imposed by teacher / school	3		E		I	I	E	E	
	imposed by peer	3			I					

Variables	Instances	Ranking of importance		Scenario 1a	Scenario 1b	Scenario 2a	Scenario 2b	Scenario 3	Scenario 4	Scenario 5
Characteristics of task	structured	3						E		E
	ill-structured	3		E	I	I	I			E
	open (abstract)	3			I		I		E	E
	closed (specific)	3						E		
	complex	3								E
	simple	1			I			E	E	
System characteristics										
IR Tasks	exclusion (age-related)	2		I	I	I	I	I	E	E
	filtering	3		I	I	I	I	I	E	E
	retrieval document	3		I	I		I		E	E
	retrieval passage	3		I	I		I	I		
	expert/person finding	2		I	I					
	opinion mining	3								
	summarization	3		I	I		I			
	knowledge-based search	3		I	I	I	I			
	question-answering	1		I	I					
	aggregated search	3		I	I					
Interfacing	tangible objects	3				E	E	E	E	E
	textual query	3		E		E	E	E	E	E
	metaphors	3								
	images	3			I	E		E	E	E
	speech	2					E			
	gestures	2								
	emotion recognition	3								

Variables	Instances	Ranking of importance		Scenario 1a	Scenario 1b	Scenario 2a	Scenario 2b	Scenario 3	Scenario 4	Scenario 5
Sources										
Domain	open	3		E	I	I	I	I	E	E
	closed	3								
Source language	Dutch	3		E	E	E	E	E	E	E
	English	3		E	E				E	
Type of media	text	3		E		E	E	E	E	E
	video	3		E	E		E		E	E
	pictures	3		E	E	E	E	E		E
	sound files	3		E	E		E			
	virtual reality	3								
	tangible objects	1				E	E	E		E
Others										
Learning styles	concrete experience	2		I	I	I	I			
	reflective observation									
	abstract conceptualization			I						
	active experimentation				I	I	I	I		
	visual learners			I	I	I	I	I		
	auditory learners							I		
	reading/writing preference learners			I						
	kinaesthetic (tactile) learners									
Transparency of interaction		3						E		E
Transparency of results		3						E		E
Social interaction	Alone	3		E	E				E	E
	Competitive	3				E		E		E
	Collaborative	3				E	E			

Annex B: Overview of tasks dependent of D2.1

In the table below the responsibilities of the different workpackages for the translation of the user requirements into functional specificities are listed.

Requirement	***WP***
User profiles (5.2.1)	2
Ease of use (5.2.2)	2
Accessibility standards (5.2.1)	2
Multimodal input (5.2.2)	2
Internet and standalone (5.2.3)	4
Devices (5.2.4)	4
Different search methods (5.3.1)	3
Media types (5.4.1)	3
Helping to build a query (5.4.2)	3
Result set management (5.5.1)	4
Search environment (5.5.2)	3
Presentation of results (5.5.3)	3
Working with results (5.5.4)	2
Restriction of resources (5.6.1)	4
Data entry (5.6.2)	4
Collaborative searching (5.7.1)	2
Stimulating collaboration (5.7.2)	4
Interfacing with existing social networks (5.7.3)	4
Conceptual maps (5.8.1)	2