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Report on User Requirements Summary and Conclusions
Volume I

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Abstract

This document summarizes the work that was conducted in the Amigo project to acquire feedback from target users on the usage scenarios that were proposed in the description of work (DOW). The research work consisted of a qualitative and quantitative evaluation of the DOW Amigo scenario. This scenario is based on the Application Domains and Intelligent User Services that are at the heart of the Amigo project. First, a thorough analysis of related work on Amigo-relevant scenarios and services was conducted. This state of the art review is presented in Volume II of this report. Second, methodologies were developed that took the goals and constraints of the Amigo project into account. The methodology consisted of a quantitative and a qualitative part. These studies were conducted, at six different sites, all following the same procedure. They are reported in Volume III of this document. Based on the results from the qualitative and quantitative research, use cases were developed for the three different application domains of the Amigo project. These use cases are reported as an internal working document. Volume I provides short summaries of Vol. II and III, and integrates the combined results as prioritized requirements.

Keyword list

Connected home, user research, qualitative evaluation, quantitative evaluation, usage scenarios, home information and entertainment applications, home care and safety applications, extended home environment, trust, privacy, awareness systems, user profiling, user modeling

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1 Introduction

This document summarizes the work that was conducted in Work package 1 of the Amigo project to acquire feedback from target users on the usage scenarios that were proposed in the description of work (DOW). These scenarios reflect the objectives for the research work that the Amigo project partners planned to work on. The goal of Work package 1 is to specify the initial user requirements for the services envisioned by the Amigo environment based on people's current attitudes, values and needs towards ambient intelligence

The Amigo scenario is the central representation that will be used throughout the duration of the project. This also implies that the role of the Amigo scenario will be multifold. First it can serve to explain the overall vision and goals of the project, a so-called strategic planning scenario. This type of scenario is not addressed in this document, as it is part of the general objectives of the Amigo project as described in the DOW. The analytic role of the software engineering scenario, i.e., the scenario from the system's viewpoint, specifying and weighing the requirements will be addressed in later phases of the Amigo project. The focus of this paper is on the human-system interaction scenario, i.e., envisioning the use of a system that has not yet been constructed.

The research work consisted of a qualitative and quantitative evaluation of the DOW Amigo scenario. This scenario is based on the Application Domains and Intelligent User Services that are at the heart of the Amigo project. First, a thorough analysis of related work on Amigo-relevant scenarios and services was conducted. This state of the art review is presented in Volume II of this report. Second, methodologies were developed that took the goals and constraints of the Amigo project into account. The methodology consisted of a quantitative and a qualitative part. These studies were conducted, at six different sites, all following the same procedure. They are reported in Volume III of this document. Based on the results from the qualitative and quantitative research, use cases were developed for the three different application domains of the Amigo project. These use cases are reported in a separate working document.

Volume I provides short summaries of Vol. II and III, and integrates the combined results as prioritized requirements.

Throughout this document references will be made to the three Amigo Application Domains: Home Care and Safety (D1), Home Information and Entertainment (D2), and the Extended Home Environment (D3), and the 6 Intelligent User Services (IUS): Context collection, aggregation and prediction (S1), User modeling and profiling (S2), Awareness and notification (S3), Content provision, selection and retrieval (S4), User Interface (S5), and Security and privacy (S6). These application domains and services form a matrix structure that will be used throughout this document to present results and to explain what was done. This basic matrix structure is shown in Table 1.

Table 1: Matrix structure for showing the relation between Amigo Application Domains (D1-D3) and Intelligent User Services (S1-S6)

	S1	S2	S3	S4	S5	S6
D1						
D2						
D3						

2 Quantitative and Qualitative Research: Scenario-driven

The first part of this chapter presents the outcome of the state-of-the art analysis, showing the results of related projects within the relevant communities. These outcomes will be presented as recommendations from the user and the technical perspective. They will especially focus on the topics that constitute a pattern in this ongoing research. The second part of this chapter presents the results and conclusions of the scenario evaluations and the methodology that was used.

2.1 Patterns in the state of the art research

Fourteen different scenarios originating from a myriad of research projects from Europe and outside Europe were used in the state of the art analysis. All Application Domains were covered, 3, 5, and 6 scenarios for Home Care and Safety (D1), Home Information and Entertainment (D2), and the Extended Home Environment (D3), respectively. The 6 services, Context collection, aggregation and prediction (S1), User modeling and profiling (S2), Awareness and notification (S3), Content provision, selection and retrieval (S4), User Interface (S5), and Security and privacy (S6) were distributed over 3, 7, 8, 4, 13 and 7 scenarios, respectively. The 14 scenarios are presented in templates which have the following headings: Title, References, Summary, Primary Application Domain, Relevant user services, Description from the User perspective, Key Issues, Implementation Details, and Discussion.

Five common topics underlie all analyzed scenarios: (1) Automatic composition of available devices, (2) Implicit, multimodal & non-standard interaction, (3) Integrating custom devices with standard devices, (4) Social awareness/ sharing of experiences, and (5) Intelligent room infrastructures. These extracted topics provide useful recommendations from a user and a technical perspective.

The *automatic composition of available devices* implies creating user interfaces that take the specific suitability of available devices into account. These devices are utilized without any or with few explicit commands from a user to provide an interface based on the best-suited device and modality combinations. The notion of inhabitants walking around with personalized gadgets that control the stationary environment seems to be an application scenario predominant enough to state the necessity of considering it in the Amigo project. Many of the scenarios focus on visual animated information such as movies to be streamed over multiple output devices, e.g., from a PDA to a wall. This implies that an Amigo infrastructure that is not limited to pre-defined interaction devices needs a component based software platform that allows upgrading, adding, and replacing software components. Furthermore, when devices in the home are to connect to each other automatically; private, public, and shared owner states, and transitions between these states have to be modeled. This also includes the modeling of cardinalities. In addition, an ontology is needed to automatically couple interaction devices in a meaningful way.

Implicit, multimodal & non-standard interaction defines means of interacting that facilitate a more natural user experience that is not bent to the requirements of a computer system, but to that of a human. The scenarios do not address the problem of several users that are concurrently interacting with multimodal systems. Most scenarios use tags or proximity detection for implicit interaction in addition, complex context reasoning techniques using context histories are used as well.

The *Integrating of custom devices with standard devices* is covered in the scenarios. The computer "as we know it" appears not to disappear completely, but to be used complimentarily to other, more human-centered means of interaction. This implies for Amigo, that users should be provided with parallel access to legacy interfaces, where applicable, i.e., don't entirely

replace users' prior knowledge, skills, and habits. Depending on the nature of the task, multiple ways of accessing certain functionality is needed, i.e., model potential users appropriately, in order to offer them different and suitable means of access.

Social awareness and sharing of experiences appears to be a challenging topic for networked home environments. One of the real strengths of networked home environments may be the capability of providing awareness information in multiple convenient ways and with different degrees of exposure. This addresses the basic human needs of sharing experiences and being aware of friends and families. Awareness information should also be synchronously and asynchronously available depending on appropriateness of situations and capabilities of the communications media used.

Since users will definitely share private and intimate information in home environments, it is highly important to provide strong and flexible privacy modes that protect intimate data, but also allow the easy sharing of this intimate information. This implies that reliable communication channels that take privacy issues into account and that also make best use of the available quality of service are needed.

Intelligent room infrastructures are building blocks that enable the realization of most of the other common issues. The optimal intelligent room infrastructure resides in the background and is only noticed by the users when they intend to interact with it. If the room infrastructure, in addition to the requested services, also implicitly senses the users' intentions and acts accordingly, then this might be perceived as a great benefit. Most scenarios use detection of the users' positions and infer their actions. In addition, interaction devices are tracked to integrate various standard or non-standard devices. Interpretation and aggregation of context data from various sources is needed to provide services through implicit user interaction. It is also important to take past behavior and preferences into account in order to provide well-suited profiles.

In summary, the results from the state of the art revolve around the identification of important topics and not on their realization. None of the evaluated scenarios provided an in-depth discussion on alternative solutions and their implications. They all focus on one implementation. This is inherent to using scenario techniques. The focus of the investigated scenarios was on the user experience. Hence, topics like, for example, security and context collection were under-represented.

2.2 Results from the Scenario Evaluations

The major objectives for conducting the qualitative and quantitative research of the Amigo scenarios are:

- To obtain feedback from users on the Amigo scenarios with regard to usefulness and appropriateness in relation to predicted and perceived user needs.

- To generate user requirements for the Amigo Intelligent User Services and applications.

The Amigo scenario describes different possible situations and events that could occur in the environment and homes of people who have an operational 'Amigo' system. This scenario is futuristic and doesn't necessarily match people's current experiences and expectations. To explain and visualize this scenario in such a way that it can be used to elicit feedback from people in a systematic and reliable way and is amenable to the generation of user requirements is a challenge. In addition, the goals and constraints of the project have to be incorporated, structured and made operational for research sessions with target users at different locations and partner sites.

Two quantitative and one qualitative method were used to elicit the feedback from the target user population on the concepts that are proposed in the Amigo project scenario. The Amigo scenario consists of four scenes, which provide a view on a day in the life of a fictional family. The scenes comprise examples of the Intelligent User Services and the Application Domains that are proposed in the Amigo project.

Table 2 shows how the Intelligent User Services (UIS) and the Application Domains are distributed over the scenes in the scenario. The numbers (1-4) in Table 2 refer to the scenes in the scenario descriptions, i.e., 1 =. Scene 1: Being followed by content; 2 = Scene 2: Playing games; 3 = Scene 3: Home caring; and 4 = Scene 4: Sharing ambiance.

Table 2: Distribution of Intelligent User Services (S1 – S6) and application domains (D1-D3) over the scenes in the Amigo scenario.

	S1	S2	S3	S4	S5	S6
D1	3		3		1, 2, 3, 4	
D2	1	1, 2	1, 2	1, 2	1, 2, 3, 4	2
D3	4	4	4		1, 2, 3, 4	4

Except for S5, User interface, not all UIS and Application Domains are present in all the scenes of the scenario.

The quantitative research method, Gallery, consisted of a preference ranking of elements in the scenes of the scenario, which were exemplars of Intelligent User Services. The first qualitative research method, MyPlace, consisted of a structured focus group session addressing the Amigo Application Domains. The second qualitative research method, IdealHome, consisted of an open-ended discussion on people's expectations of ambient intelligence technologies in their home and life. Table 3 compares these three methods. Using these three complimentary methods resulted in confirming evidence with regard to perceived user goals and needs and the match or mismatch of the proposed Amigo solutions.

Table 3: Comparison of the methods used to elicit user feedback

	Gallery	MyPlace	IdealHome
Method	Quantitative	Qualitative	Qualitative
Focus	Intelligent User Services	Application Domains	Generic
Task	Preference ranking assignment for individual participants (45)	Structured groups discussion (6-12 persons)	Open groups discussion (6-12 persons)
Data	Agreement among judges collapsed over all participating sites	Topics and value ratings clustered per application domain per site.	Topics and value ratings for each site
Interpretation of results	Results are based on how individual participants interpret the visualizations of the scenario scene's elements	Results are based on 'chemistry' in the focus group and the interpretation of the facilitator	Results are based on 'chemistry' in the focus group and the interpretation of the facilitator

The results from the Gallery evaluation could be summarized and prioritized in user requirements that are generic for multiple Intelligent User Services. Table 4 shows these results.

Table 4: Scenario elements clustered according to ranking preferences. (Highest preference for the top row, lowest preference for the bottom row)

Cluster User Needs	Scenario elements	IUS
Maintaining control and responsibility	Asking for parental permission re. Entertainment, games and information for kids	S1, S2
Reducing information overload and search burden	Providing information summaries, personalized to different people and concurrently provided at different locations in the home	S1, S2, S3, S4
Preventing household accidents and helping with the chores	Detecting and warning for faulty objects	S3
Assisting with organizing the personal home environment – individual focus	Selecting favorite songs, inducing follow-me of content, downloading of e.g., music, information, and playlists.	S1, S2, S4
Assisting with organizing the home environment – group focus	Recognizing profiles of family and friends at the entrance door to let them in, downloading profiles of visiting friends to join in the party, downloading recipes to the kitchen, adapting lights and windows to the appropriate activities in a room, conducting a videochat with friends/family at other locations.	S1, S2, S3
Caring for others and staying in touch	Peeking into each other's home, reacting towards events in one of the homes (like another person) and being knowledgeable about privacy preferences while conducting video chats.	S2, S3, S6

Table 5 shows the summary of the results of the quantitative and qualitative evaluations based on the elements that compose the scenes of the Amigo scenario (left column). It gives the top three preference rankings for the elements within each scene (middle column). Elements that didn't make it to the top 3 rankings are included in the table, but the appropriate cell is left empty. The element ranking shows the results collapsed over all sites, that is, the results of 45 judges. The recommendations for refining the scenario are shown in the right column. These recommendations are illustrated with comments from participants from the different focus groups. For detailed feedback from the participants see Volume III of Deliverable D1.2.

Table 5: Rankings of the elements in the scenes of the Amigo scenario and the recommendations for refinement (Highest rank=1, second rank=2, third rank =3)

Original scene elements	Rank Top 3 (n=45)	Feedback from focus groups (n=6-11) Recommendation for scenario element
Scene1: Being followed by content (8 elements)		
a) It plays her favorite song when she wakes up in the morning	3	Refine Use settings and play list management
b) The song follows her through the house	3	Keep
c) At the same time it shows Jerry's favorite news in another room	2	Keep
d) If she starts singing her own song, the system starts playing it		Refine Focus on user control
e) If she goes to Jerry in another room, the system stops playing		Refine Focus on user control
f) If Maria or Jerry leave the room, the system starts playing again		Refine

	the system starts playing again		Focus on user control
g)	The TV shows summaries of their favorite news	1	Refine Achieve balance between missing information and personalized information, and between complete and summarized information
h)	The news is downloaded on a portable device to take along	3	Keep Not perceived as innovative, but as quite obvious
Scene 2: Playing games (8 elements)			
a)	It asks for parental permission	1	
b)	It downloads and shows game play lists	2	Keep the game play list Focus on downloading modes: local or remote
c)	It adapts the lights and the sounds of the home to the environment of the game	2	Keep
d)	It displays a video wall to show the game and other players	2	Keep Focus on: the video wall that adapts to the environment of the game conditions and the display of other players on screen
e)	It lets the game player interact with body movements	2	Keep
f)	It recognizes friends at the front door and lets them join in the game	3	Move to scene 3 element a) for better fit
g)	It recognizes and integrates the game devices of the friend		Keep
h)	It downloads the profile of the friend	3	Keep
Scene 3: Home caring (7 elements)			
a)	It has an intelligent door that recognizes family and friends	3	Refine Integrate with a home security system
b)	It has a vestibule display showing who is home		Refine Focus on privacy matters
c)	It downloads recipes in the kitchen	3	Refine Integrate appliances in the kitchen
d)	It shows recipes and the whereabouts of the persons in the house		Refine Discard displaying the whereabouts of the persons in the house.
e)	It detects faulty items in the washing machine and warns	1	Keep Develop safety aspects (of people and appliances)
f)	It starts the dishwasher when it is full	2	Keep

	full	3	
g)	It sets up the living room for film watching, adjusts lights and curtains	3	Keep
Scene 4: Sharing ambiance (4 elements)			
a)	It shows her father at his home and Maria in her home	2	Refine Focus on agreements between both parties The system is 'always on', but not 'always there'
b)	They see each other and it lets them engage in a chat	1	Refine Go towards instant messaging more than an 'always there' system
c)	It interrupts the chat if other persons enter the room	2	Refine Focus on social rules for polite behavior
d)	It knows the privacy preferences of both Maria and her father	2	Refine A privacy system must not be managed by the system

2.3 Use Cases

Volume IV of this deliverable presents the use cases that are derived from the results in Volume II and Volume III. Volume IV is an internal project working document. Use cases are step-by-step descriptions of user-system interaction from the user's point of view. They don't provide details for how the system under development works. A user in a use case is called an actor. A use case can have several actors, they can be humans or machines, but they always have expectations from the system. Single objects may also have several roles. Use case modeling helps to establish the functional requirements in terms of modes of use. It helps to identify the actors, to identify major goals of the actors involving the system, and to expose how the actors view the system. The use cases for the Amigo Application Domains are presented in a separate working document.

3 User requirements

The results from the quantitative and qualitative studies were combined with the recommendations of the field studies. They resulted in the following user requirements. Note, these user requirements are derived from the user feedback. They do not explicitly address the distribution over Application Domains

First and foremost, maintaining control and responsibility for how they organize and maintain their physical and social household is top priority for people. These user requirements relate to scene elements that are derived from the services. That is, in S1 (Context collection, aggregation and prediction) and S2 (User modeling and profiling) by the elements, which show the role of the system in asking for parental permission with regard to content and games for their children (highest preference judgment over all sites). These requirements are always subsumed in all other requirements.

1. The user must always remain in control of the system and never the other way around
2. The system must be secure, safe and protect the privacy of all users
3. The system must provide an added value to existing systems
4. The system should never unnecessarily replace direct interaction between people
5. The home comfort should always be maintained and not be subservient to the system

Second in priority for people is the need to reduce the overload of information and the burden to search. This was made explicit in S1 (Context collection, aggregation and prediction), S2 (User modeling and profiling), S3 (Awareness and notification), and S4 (Content provision, selection and retrieval) by the elements that provided information summaries, personalized to different people, provided at different locations in the home, and dependent on context. Subsuming the user requirements with regard to control of the system, this feedback can be summarized as:

6. The system should provide concurrently the appropriate information to the right persons for the appropriate occasion at different locations, i.e., filter information, provide summaries, according to user preferences (note people refer to existing services that they know)
7. The system should enable easy access and usage of information and data from different sources.
8. The system should support storage and archiving of data in diverse ways.
9. The system should support having control over data and information for best performance

Third in priority for people is to reduce the load of housekeeping chores and to prevent all kinds of household accidents. This was made explicit in S3 (Awareness and notification) by the elements that detected faulty items in the laundry and automatically started appliances.

10. The system should reduce the time needed for household chores and where possible do cleaning jobs
11. The system should integrate and combine functionality of appliances
12. The system should be energy saving
13. The system should be cost saving

14. The system should maintain the appropriate environmental conditions of the house (temperature, humidity, light, air, dust, mites, etc.)

Fourth in priority for people is to have assistance with organizing their personal environment at home and between home and the office. This was made explicit in S1 (Context collection, aggregation and prediction), S2 (Awareness and notification) and S4 (Content provision, selection and retrieval) by the elements that selected favorite songs, induced a follow-me of content and downloaded content and play lists to different devices.

15. The system should support the activity organization and planning for multiple persons at home, between homes and between home and work

16. The system should protect against abuse, intrusions, loss of data, house hackers

17. The system should provide controllable access and respect individual preferences and authorities

18. To system should support alignment of individual and group planning, updates and notifications.

Fifth in priority for people is to have assistance with organizing their home environment. This was made explicit in S1 (Context collection, aggregation and prediction), S2 (User modeling and profiling) and S3 (Awareness and notification) by the elements that adapted the ambiance, i.e., lights, windows, to the appropriate activities in a family or game room, and the recognition of people at the main entrance.

19. The system should take context/environment conditions into account and be aware at any time of the local situation.

20. To system should support the integration of playing computer games in family routine, and approved settings.

21. To system should support playing games and entertainment with multiple people in the same room or networked environment.

Sixth in priority for people is to be supported with the care for others and to stay in touch with others. This was made explicit in S2 (User modeling and profiling), S3 (Awareness and notification) and S6 (Security and privacy) by the elements that addressed user modelling and profiling, awareness and notification, and security and privacy. To see each other while talking or being involved in joint activities from different locations was the preferred example.

22. The system should take implicit social rules of behavior into account

23. The system should support increasing number of communication moments in multiple different contexts

24. The system should enable communication with multiple people at the same time, e.g. broadcasting, democratic group planning.

25. The system should support keeping in touch with select group of friends, no need to always be connected as "me"-time is just as important.

26. The system should support feeling of connectedness to family and friends

27. The system should support 'trusted' relationships, e.g. meeting new people mainly through mutual friends.

All studies showed confirming evidence with regard to general user requirements including the very obvious, like the system should:

- Be easy to use and to configure – no need for programming by the user

- Not be used for surveillance

- Enable individual settings and preferences

- Be configurable by the user or service provider

- Be movable, in case of moving house

- Be extensible - easy to upgrade

- Be flexible

- Enable turning off individual features

- Be modular

- Be maintenance free (i.e., no need for maintenance by the user)

The participants in the field and scenario evaluation studies provided, in addition to user requirements, important feedback that could be used in rewriting the Amigo scenario. The next chapter describes an example of such a refinement.

4 Refined Amigo Scenario

The original scenario portrayed a day in the life of Maria, Jerry and their children: Robert and Pablo. The refined scenario has maintained this pattern, but assumes that the activities of the actors can also take place at other times during the day. Also, the scenario is composed of three scenes. These scenes correspond to the application domains in the Amigo project. Another writing style has been adopted for the text to wave away some of the objections of users about, amongst others, privacy invasion. Also, the 'elderly role' is portrayed as active, instead of destitute and sad. Each paragraph can be worked out in a more extensive and detailed scenario in which the subsumed requirements can be made explicit.
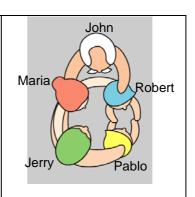
4.1 Setting

Maria moved recently to Eindhoven with her husband Jerry and their two sons Roberto and Pablo. Before moving to *Eindhoven*, Maria and her family were living with her father, John, in *Brussels.* John is living alone. Maria and her father have installed Amigo systems in their houses to maintain close contact and still feel like being part of each other's daily family life. Their Amigo systems also help them with the daily housekeeping chores, their social agendas and taking care of their news and entertainment needs.	

4.2 Scene 1: Home Information and Entertainment

Maria's Amigo system works throughout the day for her. When she wakes up in the morning, Amigo starts her day with playing music from her preferred play list, her favorite radio host, showing her personalized news or general summaries of hot news topics. Amigo can order the program such, that it follows her everywhere in the house.

When Maria leaves the house, she can continue listening, as Amigo has downloaded the content on her personal device.

Amigo does the same for Jerry. Maria and Jerry can each have personalized news and entertainment programs at the same time independent of their location in the house. If Amigo is following them and if they happen to be in the same room, or with other members of the household, Amigo discretely stops and waits for new orders.

On occasion, Maria even starts a kind of karaoke session with her Amigo; they sing along with each other.

Amigo is Roberto's playmate for video games. Amigo keeps track of Roberto's play list, the status of his scores, and the people he has been playing with, downloads the games, and protects him from inappropriate games and content after consulting this with one of his parents.

When light and sound effects are important for Roberto's video games, Amigo adapts the home environment to the game by presenting lights, sounds and video throughout the room. Roberto is then in the center of the video game and can play by moving his body. The video is presented on a large wall, which also can show the people with whom he is playing or that are on-line and want to participate.

When Roberto's friends are coming over to his house for video gaming, Amigo downloads their profiles and integrates their game devices.

When Maria and Jerry are watching a film, Amigo adapts the home environment and creates an all-surround sound, light and video ambiance.

4.3 Scene 2: Home Care and Safety

Amigo is Maria and Jerry's doorkeeper. Amigo recognizes people at the front and patio doors of the house and opens the door(s) for them if Maria and Jerry have authorized them. Amigo, like a real professional doorkeeper can notify the inhabitants, can take visiting cards and show personalized marks of the people that are present in the house, for example, a picture, a note, light or a color code.

Amigo can take over housekeeping tasks, starting and stopping the working of appliances at a desired time with the correct settings for duration, dosing, and temperature. It can even detect the presence of inappropriate objects in the appliances.

Amigo as kitchen chef downloads recipes and cooking programs to the kitchen and displays them for easy food preparation, i.e., cooking along with the video. Moreover, the recipes always take the status of the provisions in the kitchen into account.

Amigo maintains the overview of the food and household stock and generates shopping lists at predetermined time intervals. The shopping lists are personalized, but they take items that are on special offer, seasonal variations and nutritional balance into account.

4.4 Scene 3: Extended Home Environment

Roberto and his grandfather John have continued their habit of playing games together, watching a bit of TV and having their man-to-man chat. Amigo takes care of setting up the right ambiance. John's Amigo system is a modest version, with which he can be a participant in Roberto's games, just like Roberto's peers. Amigo selects the games that both John and Roberto like. They can look at each other and see what game moves are being made. Amigo can also set-up a video-conference for them in which they can watch TV together, show the newest acquisitions of their collections, or just tell their stories. With Pablo, the little one, John plays 'hide-and-seek' via this video communication.

Maria and her father have continued their habit of exercising together. Amigo sets up their exercise bikes, maintains their training schedules and lets them cycle through the video landscape displayed on the video wall in Maria's home (the one used by Roberto for games). John watches the same scenery on his display, they see each other working hard, but Amigo makes sure that they each have their personalized exercise program.

Jerry likes to chat with Maria and his father-in-law while he is commuting from work and Maria and John have their work out. Amigo integrates his mobile phone or computer system with the video-conferencing system. He doesn't want to watch their work out, but occasionally he likes to draw Roberto in the audio exchange or discuss the recipes that Maria has downloaded in the kitchen.

5 Conclusion

The Amigo scenario describes a day in the life of a family who use an operational ambient intelligence system. This scenario was evaluated with people at different geographical locations to elicit feedback on the general concepts, to generate user requirements and to refine the original Amigo scenario. Qualitative and quantitative methods were used.

The use of different methodologies made it possible to integrate the results from different evaluation sites and to generalize results. That is, a systematic approach derived from experimental design techniques and structured ethnographic methods, made it possible to integrate the feedback from a large sample of users for different intelligent user services and for different application domains. This systematic approach also made it possible to prioritize user requirements in 6 major categories. These *people* categories are, in order of importance:

1. To maintain control and responsibility for organizing and maintaining their physical household

2. To cope with the overload of information and reduce the burden to search

3. To reduce the load of housekeeping chores

4. To assist with organizing the personal environment at home and between home and work

5. To assist with organizing the overall home environment

6. To support social relations, i.e., caring and staying in touch.

The state of the art analyses showed that many research projects are addressing very different aspects that relate to these user requirements. The focus of these research projects is, however, mainly on technical solutions that are partly prerequisites to achieve ambient intelligent systems and to fulfill the above user requirements categories. Common concerns for these projects are automatic composition of available devices, implicit, multimodal & non-standard interaction, integrating custom devices with standard devices, social awareness/ sharing of experiences, and intelligent room infrastructures.

Deliverable D1.2 of the Amigo project, Report on User requirements, consists of 4 parts. Three parts (Volume I, II, and III) are public and one part is an internal working document for the project.

- Volume I: This volume presents a summary and the main conclusions for the overall deliverable.

- Volume II: This volume presents the state of the art analysis of the scenarios that are being researched by other projects.

- Volume III: This volume presents the methodologies and the results of the Amigo scenario evaluations.

- Volume IV: This volume is an internal working document that describes the use cases that are being developed for the different Amigo application domains.