AAL Joint Program

Connected Vitality, the Personal Telepresence Network (CVN)

D7.4 A document with the results of the Swedish field test

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0.2	09-09-2013	UCY	Provide Technical Information about the Swedish field test
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Due to an official project extension provided by the AAL that concerned all project partners, the initial delivery for the pilot operation in Sweden (month 30) was delayed following a later deployment of the pilot itself, so the results and analysis were done after the initial proposed date as described in this deliverable.

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1. Introduction

The following document deals with the results of the fields studies that took place in Sweden over a period of six weeks (middle of January until the beginning of March 2013). The central goal of the field studies was to **evaluate the YoooM in a "natural" setting**, offering potential end users the opportunity to try out the device at their homes. According to the proposal the main focus was on community building, thus we were especially interested in participants' experiences when using the YoooM to communicate and interact with other older adults and if they could complement or intensify relationships via the YoooM.

First of all, we will briefly describe the organization that recruited the participants and will outline the study design and central research questions of the field study. We will then summarize the results (a detailed description of the results can be found in the internal report).

The Organization

In Sweden we have three democratically elected levels of government; the Parliament at national level, the county council at regional level and the municipality at local level. There are 290 municipalities in Sweden. They have large powers of self-determination and are responsible for local issues in the immediate environment of citizens.

The highest decision-making body in the municipality of Arvika is the Municipal Council - 49 locally elected councilors, representing all shades of political opinion. Arvika is governed by the Social Democrats (23 seats).

Subordinate to the municipal political boards and committees are the administrative departments with approximately 2,200 employees.

The municipality of Arvika has 26 300 inhabitants, most of them live in the town of Arvika, but a large number live in the countryside. The municipality's mission is to serve the inhabitants of Arvika with common services like pre-school, compulsory school and upper secondary school as well as social and elderly care. The heads of departments are responsible for the overall management of the unit, which has direct personnel, operating and financial responsibility.

The Health and care department in the municipality of Arvika has 245 places in residential care homes and 650 elderly receiving home care. To describe the users/clients that the

department of health and care in Arvika Municipality helps is very difficult since it varies very much, but we will summarize some general information. Most of our clients are between 80 – 95 years old, women are represented to a greater extent than men in this age segment. The clients are in need of both personal care and medical services. In addition to the medical aid the clients need help with cleaning, preparing and buying food and washing their clothes. The clients live both in the city of Arvika and on the countryside. A big part of the clients have problems with dementia and thus face a lot of different problems.

In the current situation the contact between caregiver and caretaker almost entirely exists of visits and meetings face to face. The residential care homes are staffed all hours of the day and the seniors with home care also have the possibility to get a visit during all hours.

To use technology in the homecare and at residential care homes is in a near future for Arvika municipality. Already today there is an interest among both staff and users. Using technology for the municipality would mean that one can use resources differently than today and thus be able to increase the quality of life for many patients and reduce certain costs of care.

Since we had a lot of problems during our field test it's hard for the people in deciding positions to see the use of YoooM in our organization. But we see that a device like the YoooM has potential to help our elderly reconnecting and reviving their own past memories and experiences and to share these experiences with the younger generations within our community. We see that a device like the YoooM possibly could enhance the cohesion between the generations, curb feelings of isolation amongst our elderly, while learning about new and innovative technology to make this happen.

We will now briefly outline how the six-week field trial was organized, what kind of research questions we addressed and what kind of different methods we applied.

2. Study design

The YoooM system was evaluated on basis of various values, defined in the concept of ViA [Fuchsberger et al. 2012], which is based on the theory of consumption values (TCV). The idea behind it is to focus on the user perspective, taking into account emotions and experiences, but also include technological aspects such as the usability of the system. Thus, ViA covers a wide range of factors of Usability (U), User Experiences (UX) and User Acceptance (UA) within one concept. According to the TCV we focused on the investigation of the ***interpersonal value**, which is constituted by the factors* social presence, social connectedness, and reciprocity. Furthermore, the ***functional value*** (reliability, usability, sociability, ease of use, usefulness) and the ***emotional value*** (fun/enjoyment, computer anxiety) of the YoooM system were evaluated. To gain a more holistic picture we also assessed participants' ***social context***, e.g., with whom they are in regular contact with (for a more detailed description of the study designs see D6.2).

2.1.Research Questions

According to the values, and the main focus "Community Building", the following central research questions were defined:

Interpersonal Value
RQ1: To what extent do participants experience ***social presence*** when communicating via the YoooM device?
RQ2: To what extent do participants experience ***social connectedness*** when communicating via the YoooM device with their family and friends?
RQ3: What characterizes the communication in terms of ***reciprocity***?

Functional Value
RQ4: How do participants evaluate the ***usability*** of the YoooM system (effectiveness, efficiency, satisfaction)?
RQ5: How do participants estimate the ***sociability*** of the system?
RQ6: To what extent do participants experience the YoooM as ***easy to use***?
RQ7: How do participants estimate the ***usefulness*** of the system?

Emotional Value
RQ8: To what extent does the YoooM evoke ***fun/enjoyment***?
RQ9: What did participants like/dislike when using the different formats Meet, Club, Classroom?
RQ10: To what extent does the YoooM evoke ***computer anxiety***?

Social Context
RQ11: What characterizes participants' social network?

RQ12: How does the communication with friends look like?

    RQ12.1: To what extent are participants satisfied with the communication with their friends?'

2.2. Methodological Approach

Within the field trial a variety of different methods were applied, e.g., interviews, a diary and workshops. The following paragraph provides a brief overview on the approach. A detailed methodological description can be found in the internal concept for the field trials as well as D6.2.

At the beginning of the studies, the EUOs carried out *workshops* in order to introduce participants to the study (the procedure, e.g., what kind of materials they were asked to use, whom they can turn to in case they had any questions). Although the participants were informed about the activities they could carry out via the YoooM they were *not* introduced in detail about the handling and how the device worked. The usage of the YoooM should be self-exploratory, and participants should be able to independently get going with the device. Thus, we did not intervene in this process. At the workshops, appointments were made for the *installation of the units* and the *pre-interview* at the older adults' homes. The pre-interviews aimed at gathering information about participants' social background and their needs in terms of care.

After all units had been installed, participants started at the same time with the *six-week-field trial* (except of the participants in the Netherlands; due to some technical problems two participants started one week later). To gain information during the six weeks, participants were asked to *use a diary* to write down their experiences when using the device. The diary included open questions and structured questionnaires in order to assess users' experiences with respect to e.g., social presence or usability factors such as ease of use or usefulness. All questionnaires were self-reporting questionnaires, consisting of items to be rated on a five-point-scale. Participants were asked to indicate to what extent they agreed to the given statements. In order to gain a better overview on the findings in this report, we only report if participants agreed, disagreed to the given statements or chose the category neither nor.

Additionally to the diary, participants got a calendar where they could write down appointments they made via the YoooM (e.g., when they would meet in the Classroom or in the Club in order to play some games). It included also some notes that should remind them to carry out certain activities or to fill out a questionnaire in the diary. During the field trial, participants of the study were in regular contact with their home service provider.

At the end of the field trial, the units were de-installed and a ***short interview*** was carried out in order to discuss the materials that were used during the study and to gain information about participants' experiences.

Recruitment of participants

It was intended to recruit participants according to the profile of the Persona "Anna" that has been developed based on the data from the requirements analysis within WP1 (see D1.1), meeting the following characteristics: older than 70 years, (slightly) restricted in mobility, needs and/or receives help in terms of care, willingness to participate in social life, basic computer skills and interest in new communication technologies. Not of all of the participants that took part in the study met all these characteristics due to different reasons, e.g., additional technical requirements that needed to be fulfilled made it difficult for the end user organization to recruit participants who met all characteristics that were defined according to the persona of Anna. Thus, some of them were younger than 70 years, and all of them were still quite mobile, indicating that they could go outside for a walk without the help of others. The overall procedure is described in the following.

It was decided to use four different methods to recruit participants for the field test.

1. First of all, former participants that had partaken in earlier workshops regarding CVN were contacted.
2. Secondly, we talked to the personnel at homecare and at residential care homes to see if they had any suggestions for users who might be interested in participating.
3. The third method was to ask the personnel at the office of the Department of Health and Care to ask seniors in their proximity if they would be interested in participating in the project.
4. Finally, an advertisement in the local newspaper was published, inviting interested seniors to an information meeting.

All together there were 20 seniors that showed an interest in participating. We needed 8 seniors to take part of the test. They were chosen depending on their internet connection. It was hard to find seniors with enough bandwidth from their internet supplier.

Out of our eight participants none had any care or support from the municipality. When looking at the 20 seniors that showed interest in participating only one had help from the

municipality. This senior did not have the required bandwidth at his home.

All of the participants had experience in using computers as a communication tool – e-mail, Skype, Facebook or other social networks. All of them also had a mobile phone and a regular phone.

The motivation of the eight participants that were involved in our field test was very high from the beginning. After a couple of weeks the motivation faded for some of the participants while a few kept the motivation up during the whole field test. The fading motivation was both due to lack of interest and time but also that they grew tired because of the technical problems that we had.

3. Results

The following paragraphs provide the central results of the field trial (more detailed information can be found within the internal reports).

3.1.Participants' Profile

Overall eight participants took part, aged between 63 and 81 years (average age: 70), six were male, two were female, all of them already retired. Five participants had basic computer skills and three excellent skills. In general, all of them were interested in communication technologies. In order to gain a more detailed picture about participants social background, to understand how they normally stay in contact with their family and friends and what kind of technologies they use they were interviewed at the beginning of the field trial.

3.2.Social Context

RQ11: What characterizes participants' social network in general?

Most participants (6) are in regular contact with their family, friends and neighbors and normally stay in contact with them face-to-face, via Email or the land line telephone. All participants indicated that they have person they can count on help regarding their activities of daily living and have a least one person they can turn to in case of an emergency. All participants except for one indicated to *feel part of a group of people* sharing the same attitudes and beliefs, e.g., religious or political groups or a circle of friends they feel part of. Regarding the extent to which participants *experience being part of a social network of friends and relationships* they were asked to indicate on a scale from 1-10 (10=integrated, 1=disintegrated) to what extent they feel being part of a social network of friends and close relationships. Half of the participants (4) indicated to feel fully integrated, indicating a value of "10". Three participants indicated a value between 4 and 6, so when can assume that they neither feel fully integrated nor not integrated. We can conclude that they would probably wish to be more integrated in a social network of friends and close relationships.

RQ12: How does the communication with friends look like?

In order to stay in contact with their friends almost all participants use the phone (landline) (7), six use the mobile phone, and half of them indicated to stay in contact via the computer or via email. The most important communication technologies for the participants to be in

contact with their friends are the landline (4), the mobile phone (4), the computer (1) and Email (1).

3.3. Interpersonal Value

The interpersonal value refers to the importance of the YoooM to foster social relationships and interactions. As already mentioned before, the interpersonal value we assessed by means of three theoretical constructs: social presence, social connectedness and reciprocity (for a detailed description see D6.2).

RQ1: To what extent do participants experience social presence when communicating via the YoooM device?

With respect to the quantitative approach (questionnaires), social presence was assessed at two times: within the first week and the last week of the field trial. The data from the questionnaire (week 1) indicates that all participants experienced social presence when communicating via the YoooM (*M*=4.00, *SD*=0.48). For the last week the mean was slightly lower (*M*=3.89, *SD*=0.52). Nevertheless, it has to be considered that a value of "4" indicated that participants experienced social presence during the trial (agreed to the given statements). We will now briefly have a look at the different statements in detail. In week 1 not all participants filled out the questionnaire, because of technical problems, e.g., two out of eight participants could hardly get in contact with others via the YoooM. Six out of eight participants indicated to what extent they agreed/disagreed to the statements on social presence. All of them agreed to the statements *People at the other end seem real, I am happy to use the YoooM to interact with my friends and people I know* and *I think I get to know people very well if I met them via the YoooM.* Five participants indicated that they *get a real impression of personal contact with the people at the other end of the YoooM* and that they *get a good feeling of the people at the other end.* One participant each indicated to neither agree nor disagree to the given statements. Four participants agreed that they *get a good idea of how people at the other end are reacting* and that one *can easily assess other people's reactions to what has been said.* Two participants said that they neither agree nor disagree. Half of the participants (3) agreed that *it is just as though one is with the communication partner(s) in the same room* and half of them neither agreed nor disagreed. Only two participants agreed that it *is like meeting a person face-to-face,* four neither agreed nor disagreed. Finally only one participant indicated that *the YoooM provides a great sense of realism,* four participants neither agreed nor disagreed and one disagreed to the given

statement (see Figure 1).

Based on the data we conclude, that within the first week the majority of the participants could gain a ***good impression of their communication partner***, e.g., how s/he reacts and had the feeling that they could ***get to know the people very well*** when communicating via the YoooM. Nevertheless, ***only a few participants*** had the impression that it ***was like a face-to-face meeting*** and that the ***YoooM provides a great sense of realism*** which is also reflected in a low number of participants who agreed that it is just as being in the same room with another person. Although the technology provided a good picture of the communication partner and allowed to assess, e.g., behavior, it did not provoke a feeling of realism for all participants.
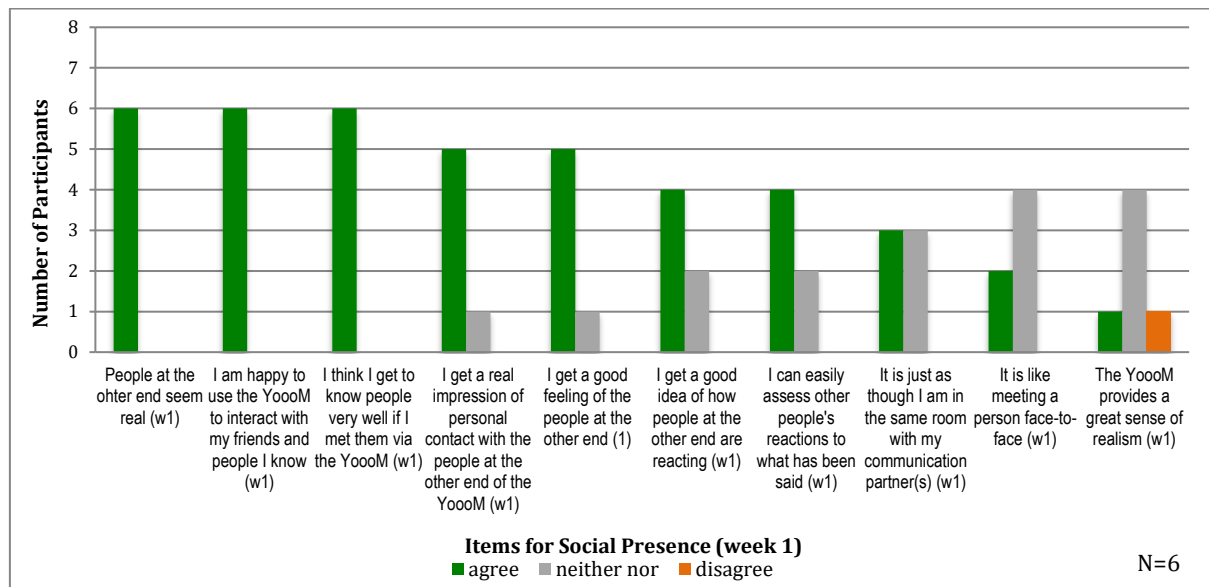
Figure 1: Items for Social Presence - degree of agreement (week 1)

In week 6 all eight participants answered the given statements and all of them agreed to the statement that ***people at the other end seem real***. Almost all of them (7) indicated that they ***get a real impression of personal contact with the people at the other end of the YoooM***, that they ***got a good feeling of the people at the other end*** and experienced that ***it is like meeting a person face-to-face.***

Six participants agreed that they ***get a good idea of how people at the other end are reacting*** and that one ***can easily assess other people's reactions to what has been said.*** Two participants indicated to neither agree nor disagree to the given statements. Six participants pointed out that they ***think they get to know people very well if they met them via the YoooM***, one participant disagreed to the statement and one participant neither agreed nor disagreed. Five participants agreed that they ***are happy to use the YoooM to interact with family and friends*** two neither agreed nor disagreed and one participant disagreed to the given statement.

Half of the participants said that it is ***just as though they were in the same room with the communication partner(s)*** four neither agreed nor disagreed. Finally only one participant agreed that ***the YoooM provides a great sense of realism*** three participants stated that they neither agree nor disagree and also three disagreed to the given statement.

We conclude that the YoooM ***provides a good picture of the communication partner*** and that most of the participants got a ***good impression of the interlocutor(s)*** but there is not that much commitment that the YoooM provides a great sense of realism (see Figure 2). The major difference between participants' statements at the beginning and at the end of the field trial is that whereas only two persons in the beginning stated that they felt that the conversation was like meeting a person face-to-face, at the end almost all of them (7) agreed to the given statement. Nevertheless only one participant agreed that the YoooM provides a great sense of realism.
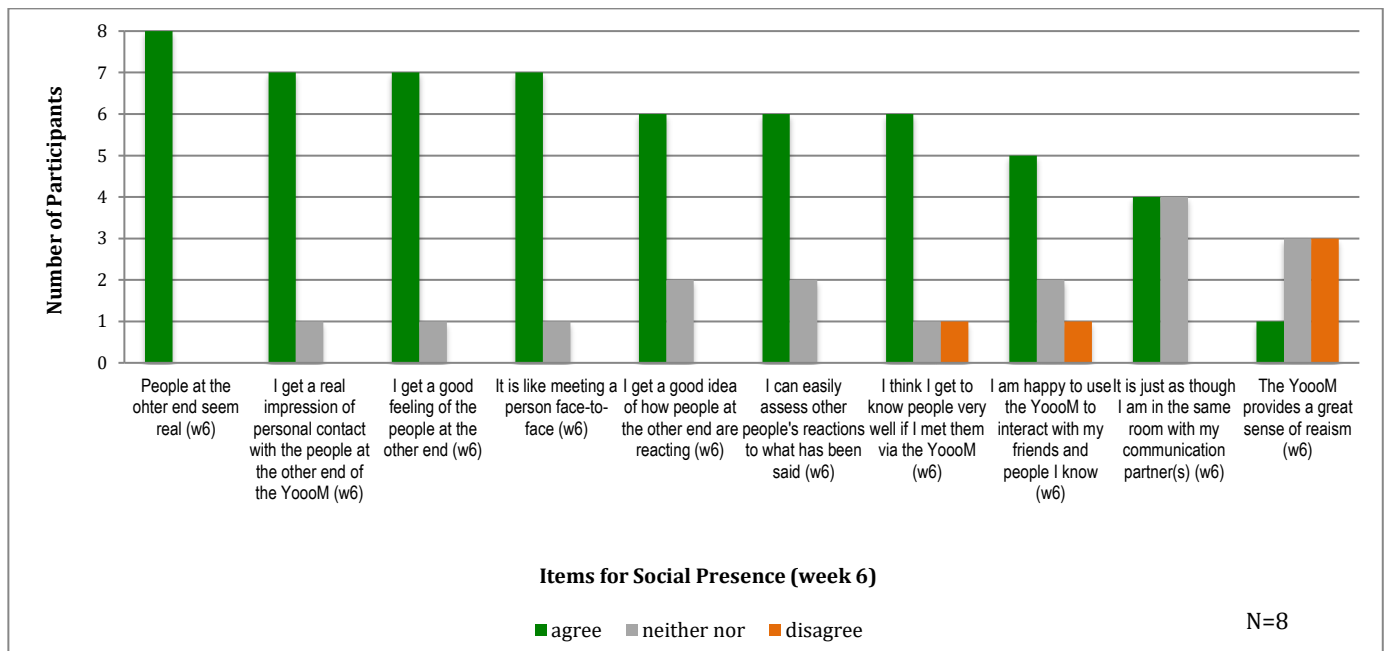
Figure 2: Items for Social Presence - degree of agreement (week 6)

The qualitative interviews at the end of the field trials aimed at identifying background information about participants' experience of social presence when communicating via the YoooM. As one important aspect of social presence is the experience of actually talking with somebody face-to face, participants were asked to indicate if they had such an experience when using the YoooM in comparison to other communication technologies (e.g., telephone, mobile phone, computer). Half of the participants (4) indicated that they ***felt like being in the same room***, which was similar to having a conversation face-to-face. Three participants

pointed out that they had a ***stronger sense of social presence than with a regular phone***. Especially the big screen that conveys a big-sized video of the communication partner and allows recognizing facial expressions, hand gestures and body movements in general supported the experience of actually ***talking to another person face-to-face.*** Moreover, participants appreciated that they could see the environment around the communication partner, e.g., artworks or decorative items, which supported their feeling of social presence (1). Two statements should illustrate this: *"You really had to tidy up a bit before you called someone." "Someone asked me about the pictures I had on the wall behind me or the bills that lay on my desk. Fun!"* Only one participant stated that s/he did not have the feeling of talking to a person face-to-face, pointing out that s/he was always aware that the communication happens via the YoooM and not face to face.

Participants were also asked about their **first impression** when talking via the Meet format and to indicate what comes to their mind when thinking about the communication in general. The majority of participants (6) said that it was a ***good first experience***, that they had fun to see each other (3) and that it is a ***good possibility to communicate*** (1). One person stated: *"It seemed like we knew each other better than we did."* Again, half of the participants (4) pointed out that there were technical problems making it difficult to connect to each other and that it was sometimes hard to have a "normal conversation due to the bad synchronization between video and sound (2). One person stated that s/he had a rather negative general impression about the YoooM as it did not work at all.

RQ2: To what extent do participants experience social connectedness when communicating via the YoooM device with their family and friends?

Social connectedness was assessed during the six week field trial, asking participants' to write down in the diary what makes them feeling connected when using different communication technologies (land line, mobile phone, video telephony, YoooM). Moreover, at the end of the field trial participants were asked if they felt connected when communicating via the YoooM with their friends.

With respect to the diary, unfortunately participants just noted ***if*** they experienced closeness when using different communication technologies but often did not indicate ***why.*** Thus, it was not possible to gain any background information about participants' experiences when using different kinds of communication technologies. Nevertheless, we could gain some insights which are based on additional notes participants made within the diary, which are outlined in the following.

Two participants stated that the ***telephone (land line) does not provide the same closeness as the YoooM*** and one participant pointed out that s/he experiences ***more closeness*** when communicating via the YoooM than via the telephone. Two participants indicated that they ***experience a kind of distance*** when communicating via the telephone. *"One can feel that there is a distance."*

Regarding the communication via the ***Mobile Phone*** two participants pointed out that they experienced ***not the same/so much closeness*** than with the YoooM. One of these participants mentioned that it is though not that much closeness but it is easy to get in contact with each other. One participant said that the person s/he is talking to when communicating via the mobile phone ***seems close.***

Regarding ***Video Telephony (e.g., Skype)*** participants did not make any statements about closeness. With respect to the usage of the ***YoooM*** only one participant stated that s/he experiences a kind of closeness but that the varieties of technical problems were an obstacle.

The aim of the interview at the end of the field trial was to gain insights if and to what extent participants could imagine to use the YoooM in order to be in contact with their family and friends and if it could support them to feel connected to others.

All participants (8) indicated that in general they ***could imagine using the YoooM*** to be in contact with their family and friends, especially with people who are living far away (3). Nevertheless, a few of them (3) stated that they ***would only use it if they were disabled by a disease or were restricted in mobility.*** Nevertheless some of them (3) pointed out that the device needed to be improved first. Two participants said that they could imagine using the YoooM in order to be in contact with a care giver or a care organization.

All of the participants said that they ***made new acquaintances*** via the YoooM and one out of eight stated that s/he became friends with several people of the group. Almost all participants ***felt integrated in the group*** when communicating via the YoooM (7) and half of them (4) indicated that the opportunity of ***seeing and hearing each other contributed to the feeling of social integration***. One participant stated *"... I did not know any persons in the group, but I feel that the YoooM allows me to become friends with several of the group."*

More than half of the participants (5) pointed out that the fact that one could see and talk to other persons in the group contributed to their ***feeling of being socially integrated*** when communicating via the device. One participant said that it was the awareness of being part of a common project made him/her feeling part of the group.

All participants took part in almost every course that was offered via the YoooM (8) and **enjoyed the common activities within the classroom**. The following statement of one participant reflects this opinion: *"In general the classroom activities were the best that depends a lot on the fact that we created a feeling of being a part of a group even if we had technical problems. We created a good community!"* Only one participant stated that s/he was not sure about feeling integrated in the group.

RQ3: What characterizes the communication in terms of reciprocity?

In order to assess reciprocity, "data logging" was used in order to identify how often participants got in contact with other users of the YoooM.

Initially it was intended that during the first three weeks communication activities (Meet, Club, Classroom) are initiated and in the last three weeks not in order to find out how participants use the device by themselves. Unfortunately, due to the variety of technical problems that occurred, all activities were initiated otherwise the participants would not have used the YoooM device frequently. The biggest problem was that the Meet format did not work properly and participants got tired of trying. It has to be considered that most of the participants did not know each other from the beginning and when it did not work participants felt that they caused each other problems. Making a single call occasionally became a huge process. Sometimes, participants were sitting in front of the YoooM for more than 20 minutes waiting for a call to connect, ending up with calling each other via the regular phone, saying "let's give up" or "let's try it again". Summing up, it was too hard and too difficult for the participants to schedule the activities by themselves.

Overall, six Classroom activities were scheduled by the care giver and four Classroom activities were scheduled by the participants, who had some ideas what they could share with other participants. Moreover, six Club activities were planned and initiated by the care giver. The dates for the activities were sent out with the regular post and participants chose which activities suited best according to their schedule. If an activity was postponed or cancelled for some reason, the care giver sent out an Email to all participants to inform them.

Most of the participants initiated at least one activity (Classroom, Game, News, Excursion). The biggest problem was, that since the Meet format did not work properly they got tired of trying again and again or sometimes simply used their regular phone to get in touch with other people.

Summary: Interpersonal Value

The results indicate that for most of the participants in our study the YoooM provides interpersonal value and thus *supports and fosters social communication and interaction*. The YoooM provides a variety of non-verbal cues, making participants of our study experiencing that they were actually talking to a person face-to-face and enabled to feel a kind of connectedness which was higher compared to other communication technologies participants regularly use, e.g., the land line or the mobile phone. All of the participants could imagine using the YoooM to stay in contact with their family and friends and more than half of the participants pointed out that seeing and hearing the communication partner contributed to a feeling of social integration.

3.4. Functional Value

The functional value, constituted by the factors effectiveness, efficiency and satisfaction (usability of the system), sociability, ease of use and perceived usefulness, is considered as the perceived utility for achieving a specific task or a practical goal. The central results are outlined in the following.

RQ4: How do participants evaluate the usability of the system (effectiveness, efficiency, satisfaction)?

With respect to the usability, normally an overall SUS-score would be calculated. Due to the small number of participants (only 5 out of 8) who responded to the given statements, the data was evaluated qualitatively.

In week one not all participants answered the questions, which might be explained by the variety of technical problems at the beginning of the trial. All participants who responded to the questions (5) agreed that they *find the various functions of the YoooM are well integrated,* that they *feel very confident using the YoooM,* think that *the YoooM is cumbersome and easy to use.* Almost all (4) agreed that the *YoooM is easy to use* and three participants pointed out that they *would like to use the YoooM frequently;* two persons neither agreed nor disagreed to this statement. Only one participant stated that s/he *finds the YoooM unnecessarily complex,* three participants disagreed and one neither agreed nor disagreed to the give statement. One person agreed that s/he *would need the support of a technical person to be able to use the YoooM*, one person neither agreed nor disagreed and three indicated that they won't need support. One person said that s/he *would need to learn a*

lot of things before s/he could get going with the YoooM; the other four participants disagreed to this statement. Finally four participants disagreed that *there is too much inconsistency when using the YoooM,* one person neither agreed nor disagreed to the given statement. Thus, within week one, the majority of participants indicated that the YoooM is easy to use, that they *don't experience the system as quite complex*, *won't need to learn a lot of things* nor would *need technical support* to get going with the YoooM (see Figure 3).
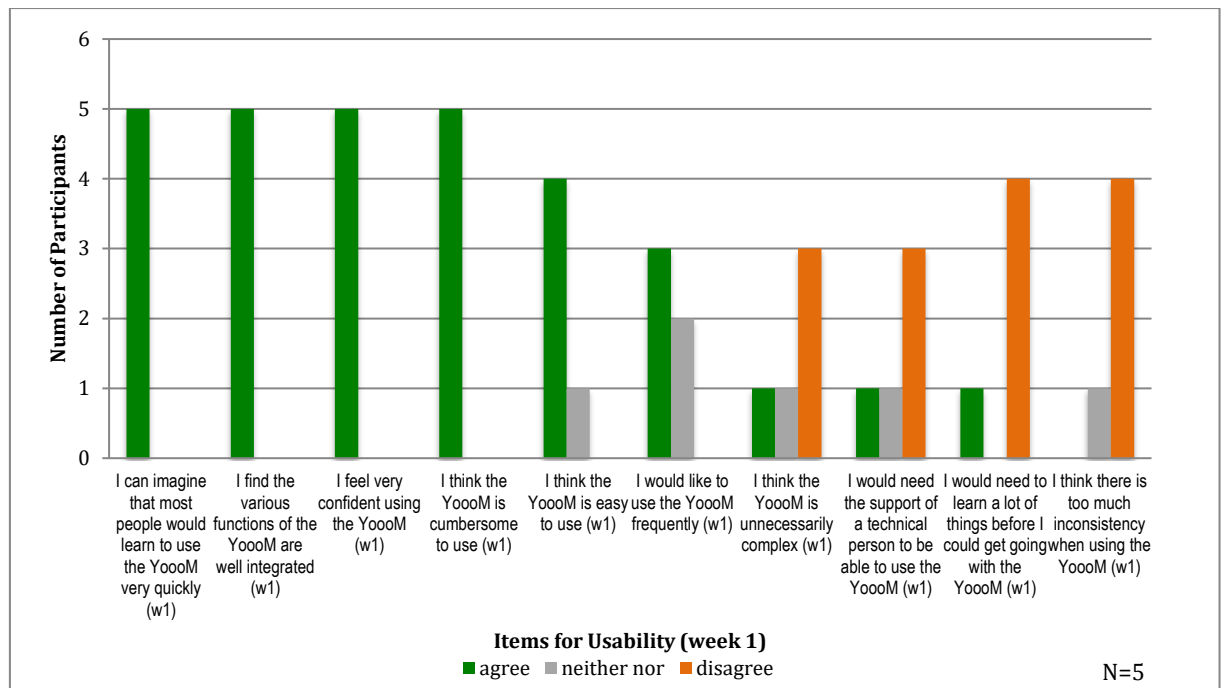

Figure 3: Items for Usability (week 1)

In week 6, at the end of the field trial all participants answered the questions about the usability of the system and almost all of them (7) agreed that they *could imagine that most people would learn to use the YoooM very quickly*; one participant neither agreed nor disagreed to the statement. The majority (6) said that *they find the various functions of the YoooM are well integrated* and that they *feel confident using the YoooM.* Two participants neither agreed nor disagreed to the given statements. Six participants agreed that *they find the YoooM easy to use,* two participants not. Although a majority of the participants agreed that they find the YoooM easy to use, they also stated that they *would need the support of a technical person to be able to use the YoooM* (6); two participants neither agreed nor disagreed. Five participants stated that they think *the YoooM is cumbersome to use,* one disagreed, two neither agreed nor disagreed. Less than half of the participants (3) *would like to use the YoooM frequently*, one disagreed to the statement and four indicated to neither agree nor disagree. The YoooM is not experienced as being *unnecessarily complex*, reflected

in the disagreement to the statement of six participants; one neither agreed nor disagreed and one agreed to the statement. Moreover, four participants disagreed that ***there is too much inconsistency,*** two participants neither agreed nor disagreed and one agreed (missing=1), and finally almost all indicated that they do not agree that ***they would need to learn a lot of things before they could get going with the YoooM*** (one participant stated neither nor) (see Figure 4).
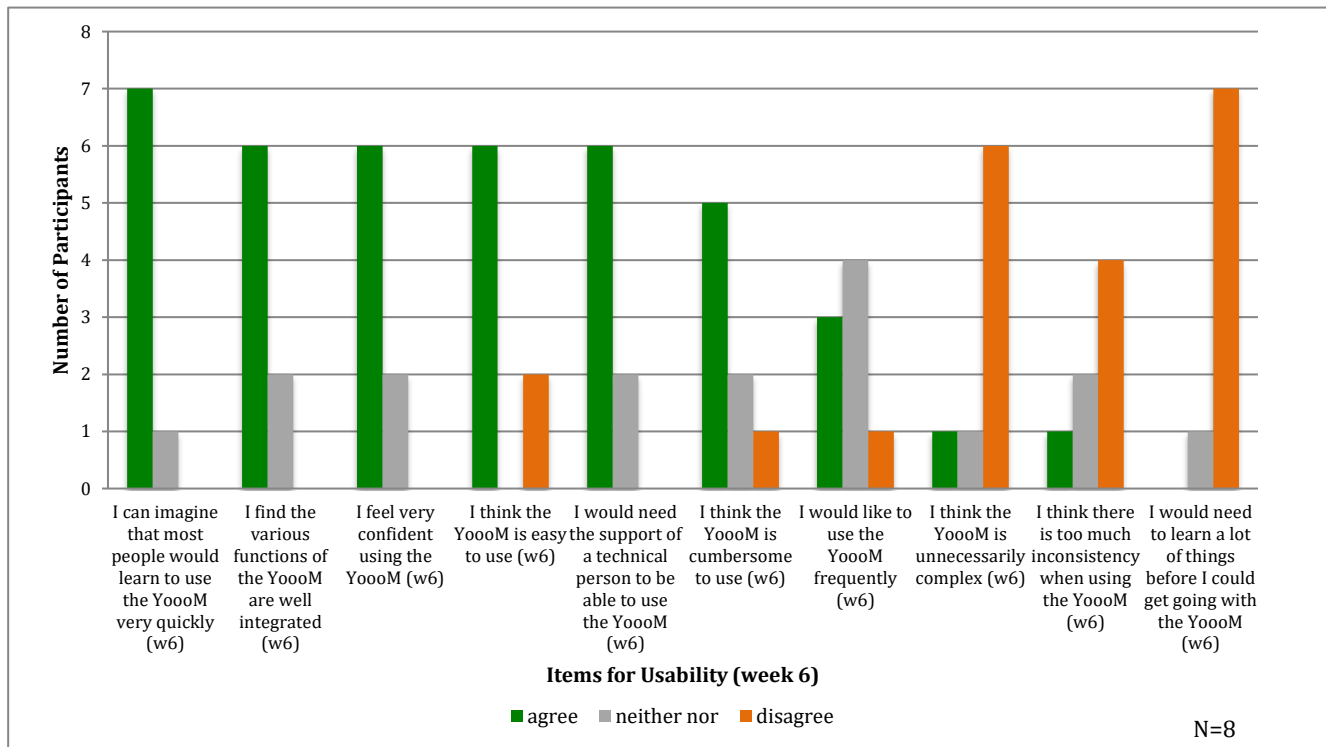

Figure 4: Items for Usability - degree of agreement (week 6)

The major difference with respect to the usability of the system between week 1 and week 6 is that whereas at the beginning of the field study only one participant agreed that s/he ***would need technical support before getting going with the YoooM*** at the end of the field trial almost all participants (7) indicated that they agree to the given statement, meaning that they did not expect to work with the YoooM on their own. This could be again explained by the fact that a lot of technical problems occurred during the field trial and a lot of technical support was required.

RQ5: How do participants estimate the sociability of the system?

Within week 3 seven participants responded to the questionnaire. More than half of the participants (4) indicated that the YoooM enables them to ***feel incorporated in a group***, almost half of them (3) said that the YoooM enables them to ***develop a good relationship*** with

other people, to have *spontaneous informal conversations* and that they could *easily contact family and friends*. Only two participants stated that the YoooM enables them to *avoid loneliness*. One participant indicated that the YoooM allows *getting a good impression of other people*. None of the participants chose the statement *the YoooM enables to identify oneself with other users*.

At the end of the field study almost all participants (7) indicated that the YoooM enables them to *feel incorporated in a group*, almost half of the participants (3) pointed out that the YoooM enables them to *develop a good relationship* with other people, to *have non-task related conversations* and to *have spontaneous informal conversations*. Two participants said that the YoooM enables to *make close friendships* and to *avoid loneliness* and only one participant said that the YoooM *enables to get a good impression of other people* and to *easily contact family and friends.*
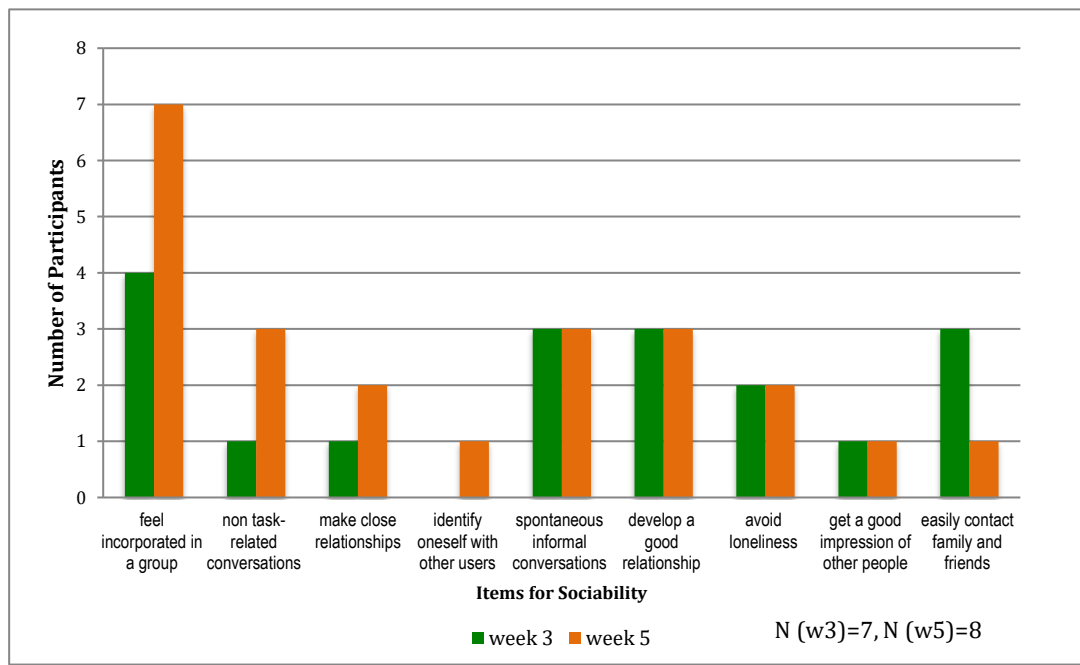
Comparing week 3 and week 6 (see

Figure 5
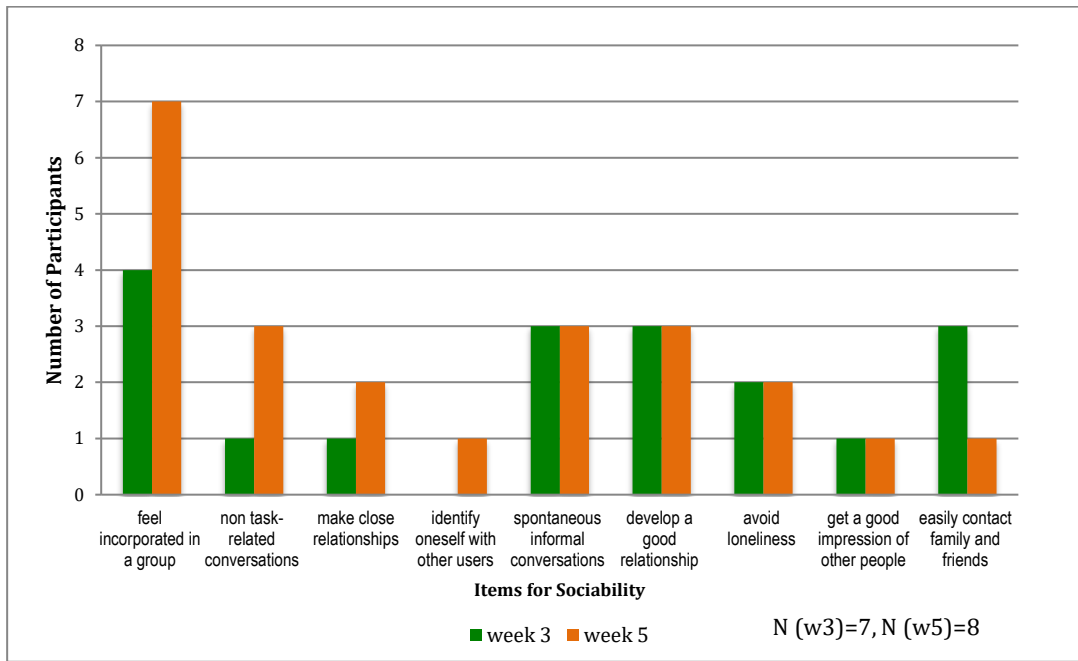
Figure 5Figure 5) almost twice as many participants (7) indicated that the YoooM enables them to ***feel incorporated in a group***. In week three only one person stated that it enables ***non-task related conversations*** (compared to six it week 3). Whereas, three participants indicated in week 3 that the YoooM enables to ***easily contact family and friends***, only one person stated this in week 6. This can be traced back to the fact that participants used the YoooM in a first instance for group activities and not to be in contact with family and friends.

Figure 5: Items for Sociability – agreement week 3 and 6

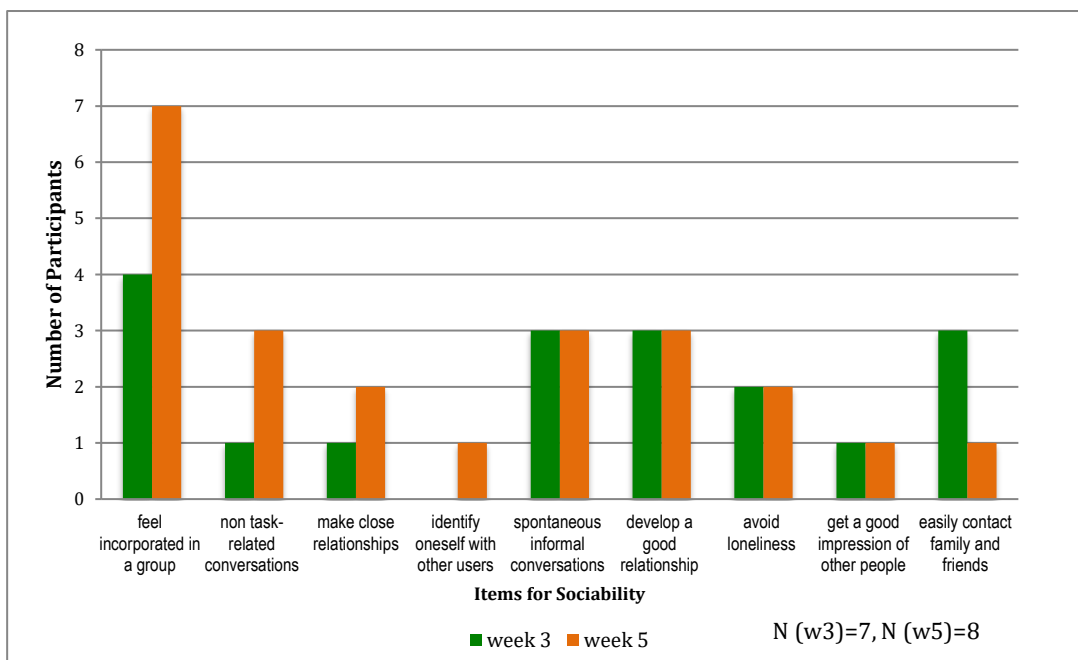Summing up, regarding sociability the field studies revealed that half of the participants experienced to feel incorporated in a group when using the YoooM over a period of approximately three weeks. This increased up to almost all participants until the end of the field study (after six weeks). We can assume that especially the opportunity to see and hear each other when having a group conversation contributed to this experience. A difference was also identified regarding the item *the YoooM allows for non-task-related conversations*. After three weeks only one person indicated that the YoooM allows non-task related conversations; this increased up to three participants until the end of the studies. Conversely, three participants indicated after three weeks that the *YoooM allows to easily contact family and friends,* which decreased to one participant at the end of the field trial. This might be explained by the fact that the participants only were in contact with other older adults taking part in the study and did not think about the opportunity of using the YoooM in order to get in contact with their family in the future.

RQ6: To what extent do participants experience the YoooM as easy to use?

Two participants did not fill out the questionnaire in week 2 because there were a lot of technical issues and participants felt that they could not say anything about the system with respect to the questions that were asked. In week 2 all participants who responded to the given statements (6) indicated that *it is easy to get the YoooM to do what they want it to do.* Four participants said that *it was easy to become skillful at using the YoooM,* one participant disagreed to the statement and another participant neither agreed nor disagreed. Four participants said that *it was easy for them to learn how to operate the YoooM;* two participants neither agreed nor disagreed. Four participants said that *they find the YoooM flexible to interact* with, two participants neither agreed nor disagreed. Half of the participants who responded to the statements in week 2 (3) indicated that they *find the YoooM easy to use* and half of them (3) not. Finally only one participant thought that *the interaction with the YoooM is clear and understandable;* five participants neither agreed nor disagreed to the given statements (see Figure 6).
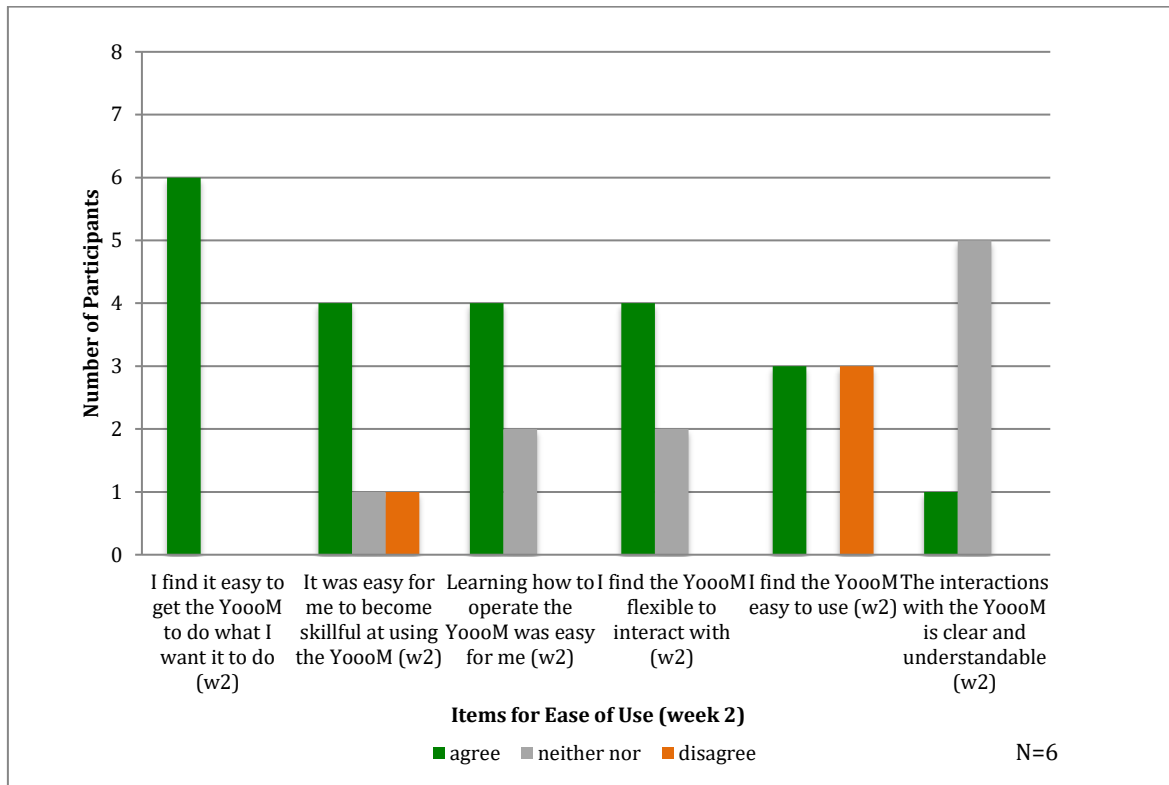
Figure 6: Items for Ease of Use – degree of agreement (week 2)

At the end of the field study all participants indicated their agreement/disagreement to the given statements (excluding two statements). Almost all participants (7) said that ***learning how to operate the YoooM was easy for them,*** for one participant it was not easy to learn how to operate the YoooM. Almost all participants (7) indicated that ***the interaction with the YoooM is clear and understandable*** and one participant neither agreed nor disagreed to the statement. Moreover, almost all respondents said that ***they find the YoooM easy to use;*** one participant disagreed. More than half of the participants (5) pointed out that ***it was easy for them to become skillful at using the YoooM***, two neither agreed nor disagreed on (missing=1). Four participants stated that ***they find the YoooM flexible to interact with,*** two neither agreed nor disagreed and one disagreed (missing=1). Finally half of the participants said that ***it is easy to get the YoooM to do what they want it to do*** one did not agree nor disagree and three participants disagreed to the given statement.
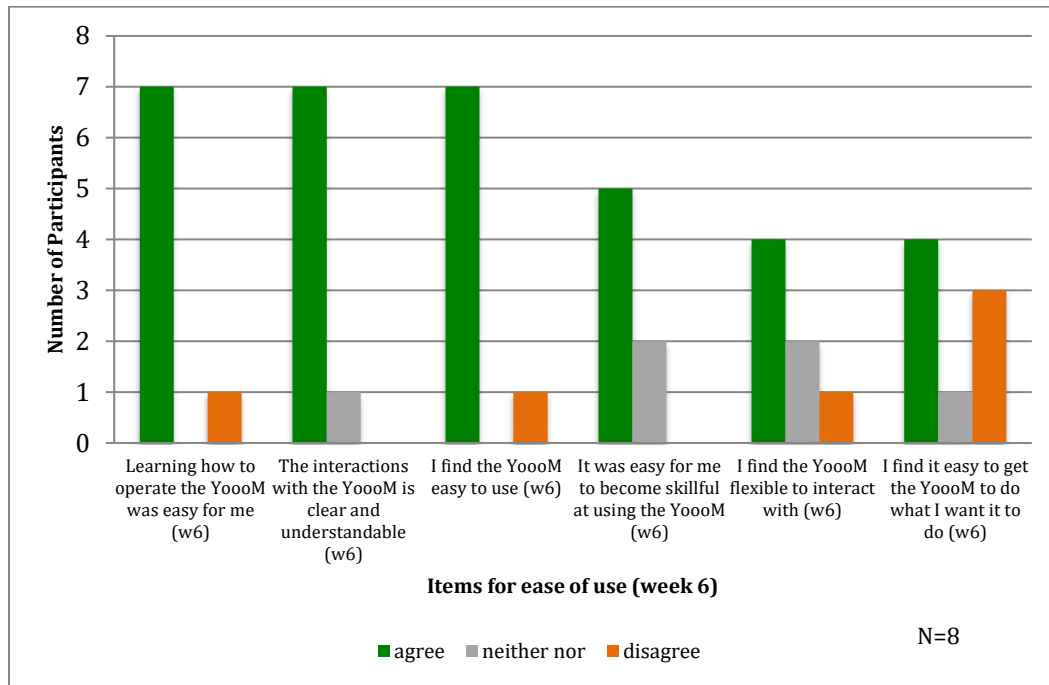
Figure 7: Items for Ease of Use – degree of agreement (week 6)

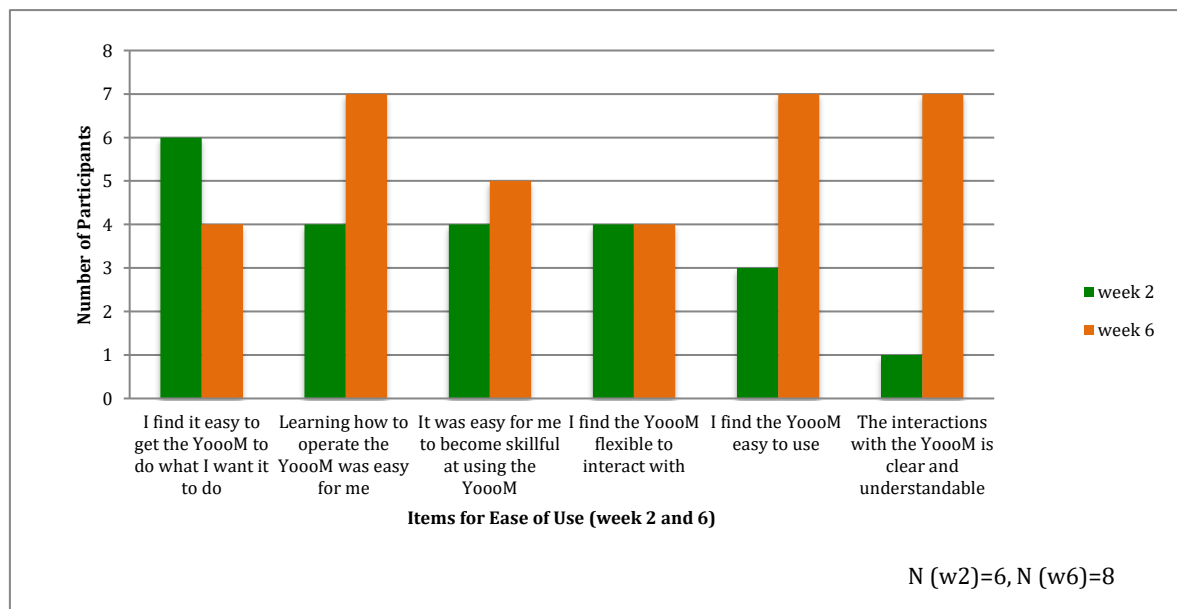*Comparing participants' ratings in week 2 and week 6 (see*

Figure 8

N (w2)=6, N (w6)=8

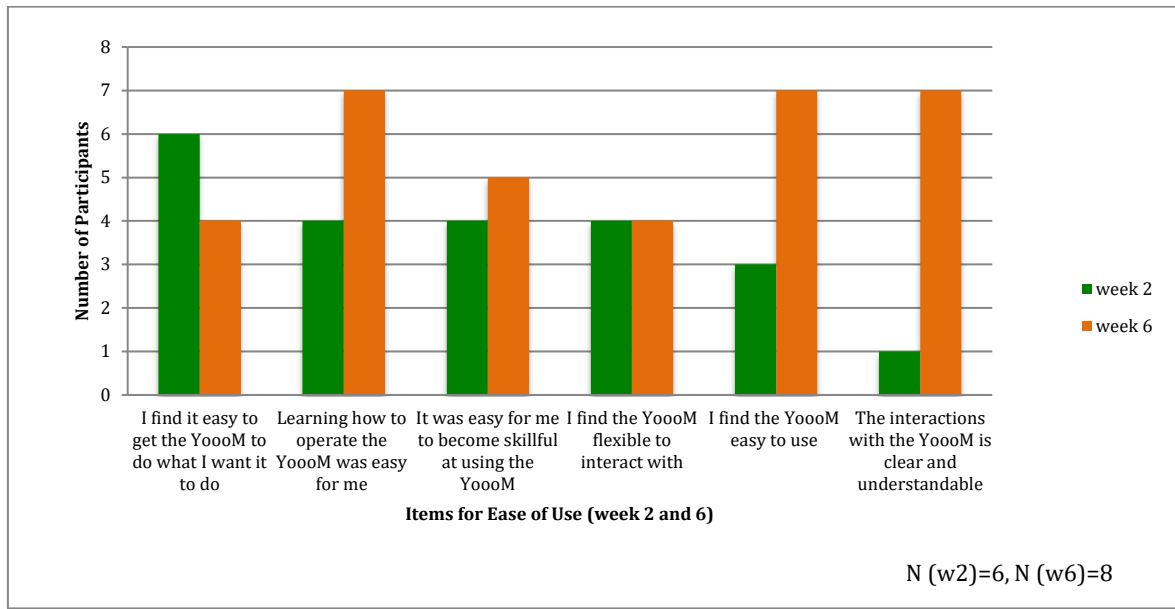Figure 8Figure 8) we see that whereas all participants (6) who responded to the statements, indicated their agreement to *"I find it easy to get the YoooM to do what they want it to do"* only four participants stated this at the end of the field trial, which can be traced back to the variety of technical problems. Nevertheless, whereas only three participants agreed in week 2 to the statement that they *find the YoooM easy to use*, almost all participants (7) agreed to the statement at the end of the field trial. Differences were identified regarding the statement *"Learning how to operate the YoooM was easy for me".* In week 2, four participants said that they found it easy, in week 6 almost all participants (7) pointed out that they found it easy to learn how to operate the YoooM. Remarkable differences were identified regarding clarity and understandability in the interaction with the YoooM. In week 2 only one participant said that *the interaction with the YoooM is clear and understandable*; at the end of the trial all participants (7) agreed to the given statement.
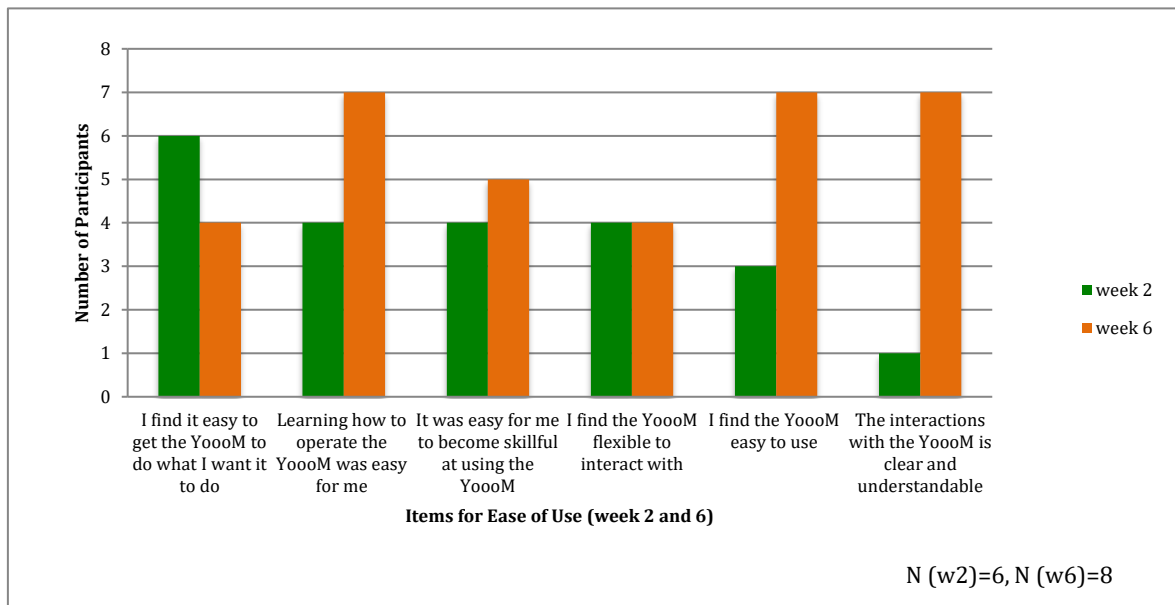
Figure 8: Items for Ease of Use – agreement week 2 and 6

Summing up, at the end of the field trial almost all participants agreed that the interaction was clear and understandable, that it was easy to learn how to operate the YoooM and that they find the operation of the YoooM is easy. Nevertheless, only half of the participants agreed that they find it easy to get the YoooM to do what they want it to do.

RQ7: How do participants estimate the usefulness of the system?

As already mentioned, not all participants answered the questionnaire (missing=2) as there were a lot of technical problems, and some participants could hardly use the device. In week 2 all participants who indicated their agreement/disagreement to the statements (6) pointed out that they think that ***the YoooM can assist them in conducting activities with other people***, almost all of them (5) stated that they ***think that the YoooM is useful for them*** and one participant disagreed to the statement. Four participants said that ***it is beneficial for them to use the YoooM*** and two participants neither agreed nor disagreed to the given statement (see Figure 9).
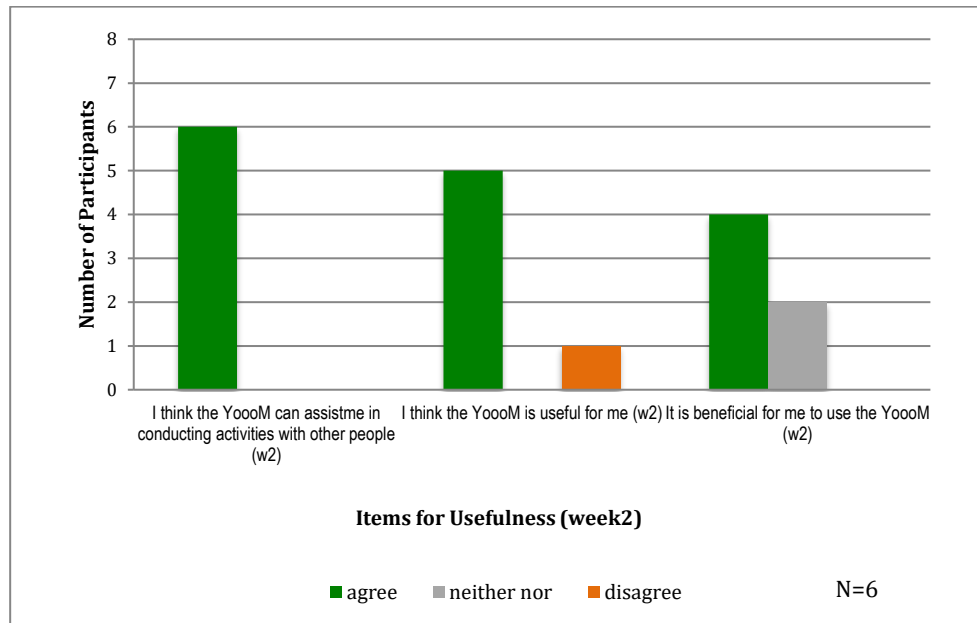
Figure 9: Items for Usefulness - degree of agreement (week 2)

In week 6 almost all participants stated that **the YoooM is useful for them** (7), one participant neither agreed nor disagreed. Six participants agreed that **it is beneficial for them to use the YoooM**, one participant neither agreed nor disagreed (missing=1). Finally, six participants stated that they think **the YoooM can assist them in conducting activities with other people**, one participant neither agreed nor disagreed (see Figure 10).
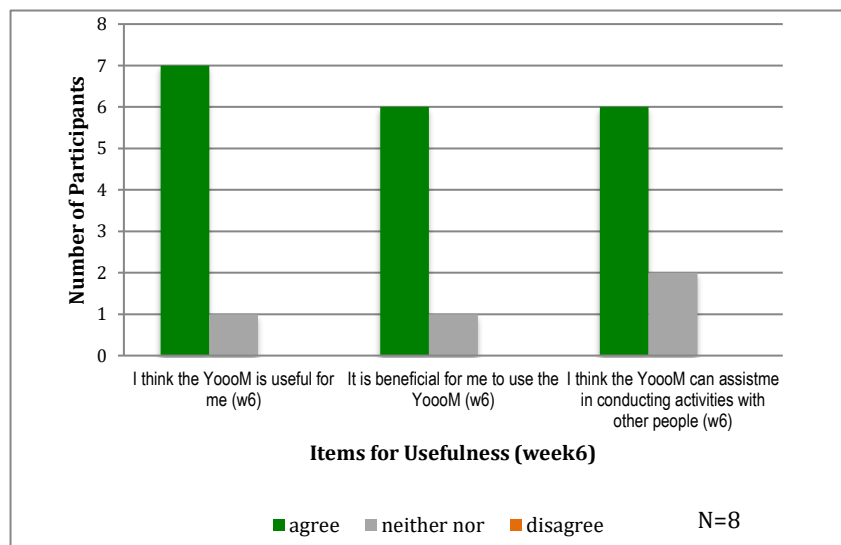
Figure 10: Items for Usefulness - degree of agreement (week 6)

Comparing participants' statements from the beginning and the end of the field trial (see Figure 11) we see that whereas only four participants agreed that **it is beneficial for them to use the YoooM** at the beginning, this slightly increased up to six participants in week 6. Regarding the statement **"I think the YoooM is useful for me"** the agreement increased from

five participants in week 2 up to 7 participants at the end of the field trial in week 6.
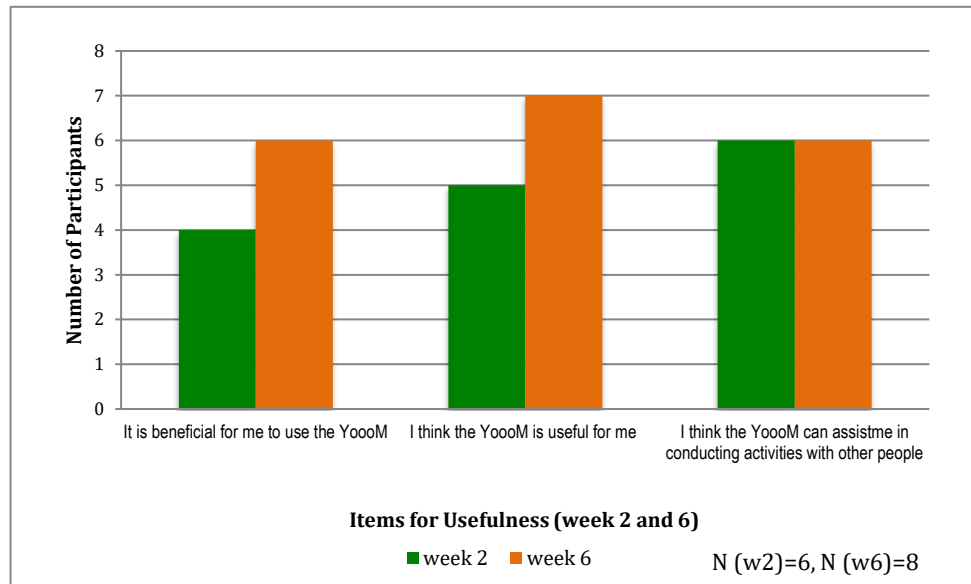

Figure 11: Items for Usefulness – agreement week 2 and 6

Summary: Functional Value

Regarding the functional value, with respect to usability, sociability, ease of use and usefulness the following central findings were identified: In general, the majority of participants experienced the YoooM as *easy to use* and *can imagine that users will quickly learn how to use it.* Nevertheless, almost all participants (6) pointed out after the six-week-field trial that they would need technical support to get going with the YoooM. Moreover, regarding sociability, all participants agreed that the YoooM *allows feeling incorporated*, which seems to be mainly supported by the fact that one can see and hear each other during the conversation. Besides a majority of respondents agree that it *enables non-task related conversations*. With respect to ease of use most of the participants indicated that it was *easy to learn how to operate the YoooM* and that they find the YoooM *easy to use*, which increased until the end of the field trial. Finally, the number of participants increased who agreed to the statements concerning the usefulness of the system. Almost all respondents indicated at the end that *it is beneficial* for them to use it (6), that it is *useful* (7) and that it *could assist them* in conducting activities with other people (6).

3.5.Emotional Value

The emotional value, considered as the potential of a technology to arouse emotions, which are believed to accompany the use, was is constituted by the factors fun/enjoyment when using the different formats likes and dislikes and anxiety.

Fun and enjoyment was assessed within the diary, asking participants to indicate how much they enjoyed the communication with respect to the three different formats (week 1-5). Therefore, a smiley scale was used consisting of 5 smileys (two positive, one neutral, two negative). Moreover, within the post interview participants were asked to talk about their general experience of fun/enjoyment and to indicate examples (e.g., What did you enjoy?).

Besides, participants were asked to write down likes and dislikes (diary, week 1-5). Moreover, at the end of the field trial more background information regarding likes and dislikes was assessed within an interview. Finally, to evaluate computer anxiety we used three items, which were part of the diary (week 2&6).

RQ8: To what extent does the YoooM evoke fun/enjoyment?

Based on the data from the diary, participants' statements regarding fun/enjoyment ranged between neutral (neither agree nor disagree) and positive. Data analysis revealed no relationship between duration of use and enjoyment. The highest ratings were for playing games (4.0 in week 5), Classroom activities (4.0 in week 5) and calling somebody via the Meet format (4.0 in week 3). The lowest ratings were for calling via the Meet format (2.8 in week 2) (see Figure 12), which can be explained by the technical problems that occurred when trying to make contact via the Meet format.
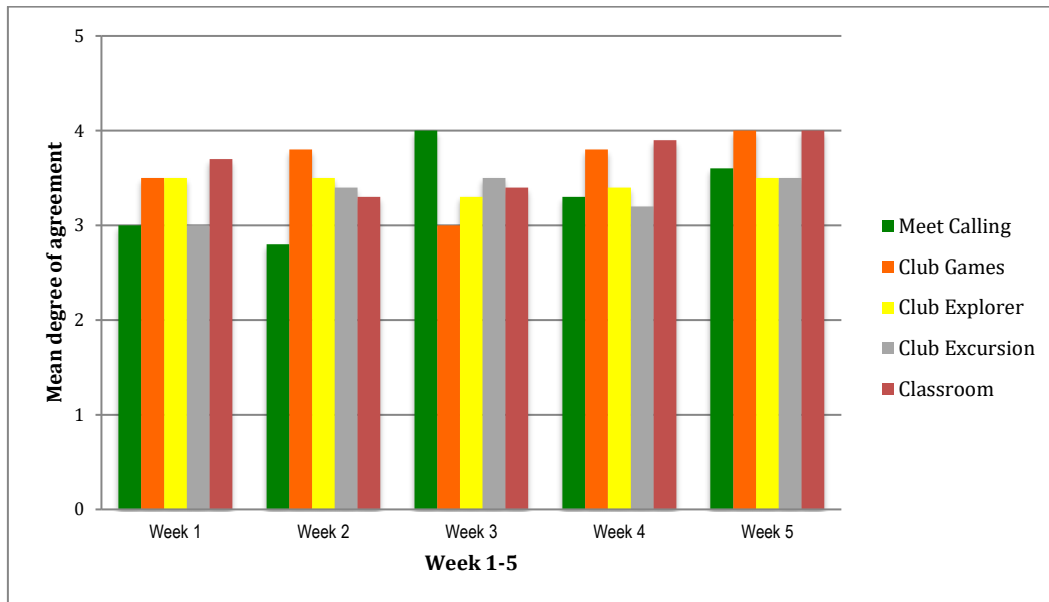
Figure 12: Experienced Fun/Enjoyment

Within the interview at the end of the field trial all participants indicated that the usage would be more fun if the YoooM would be improved (connection, sound and picture quality, speed). One person indicated that s/he enjoyed interacting via the YoooM as it was fun to try out new things and another person said that it was fun as it was useful.

Meet Format

With respect to the Meet format, more than half of the participants (5) indicated that they **especially enjoyed seeing the person** they were talking to when communicating via the YoooM and supporting with their **body language and gestures** what they were talking about (2). The following statements, concerning the video communication illustrates this: *"It's fun to see the one you are talking to"* (The participant was so enthusiastic that she pointed out to note this statement three times). Another participant pointed out that *"To be able to talk with your hands and to show things."* One person said that it was fun to get to know other people, when communicating via the Meet format.

Club and Classroom Format

With respect to the formats Club and Classroom, more than half of the participants **enjoyed being part of the activities** that were held in the Classroom, for example the book circles as well as discussions about various issues (5). Two participants stated that they **enjoyed to exchange knowledge and to learn new things**.

Some participants indicated that the **games in the Club were stupid** as well as too easy (3).

The ***Excursion format was not easy to manage*** (1), but yet could be fun if the videos were better synchronized (1). Two participants ***enjoyed reading the newspaper*** on the YoooM. Three participants indicated that they did not like the Excursion because of the variety of technical problems that occurred (3). One person pointed out that the game ***"Ludo" was the best game***.

RQ9: What did participants like/dislike when using the different formats Meet, Club, Classroom?

In the following likes and disliked are presented and structured with respect to the particular formats Meet, Club and Classroom. The results are based on the data that was gained through the diary.

Meet

In the **first week**, three participants stated that they had positive experiences when communicating via the Meet format. One participant experienced the Meet format as follows *"Nice to get so 'close' to the one you are talking to."* One participant said that s/he liked that one could see the person one is talking to.

Two participants had ***problems with the installation*** and thus, could not use the YoooM in this week, whereas two participants even talked three times together via the device. However, ***all participants experienced technical problems*** in the first week. Some had problems with the connection (5) and one person criticized the delay in picture and sound. One participant stated: *"It was not possible to call at all in the first week."*

In the **second week** a person still had problems with the YoooM as his/her Internet connection was bad. One participant indicated that the ***picture is ok*** and another one mentioned that ***it is a nice way to get to know each other in the group***. Still four people had technical problems to call somebody. One participant experienced the following problem: "*Because of the delays in sound and video it is hard to know when to speak. You have to learn how to know when it is your turn to talk."* (Meaning that it was not clear or him/her how to gain attention from all other conversation partners, indicating that s/he wants to talk now)

In the **third week** two people indicated that it is ***nice to hear as well as to see the other person***. Another two participants used the Meet format and had positive experiences with the YoooM: *"A participant called me and it worked perfectly."*

Nevertheless, three participants often had problems to connect to another YoooM in this week. One participant even stated that the YoooM got disconnected and an error message occurred.

Again, one participant indicated that there is a delay between sound and video.

In the **fourth week** some participants stated that they like communicating via the YoooM (3). One participant indicated that it is a ***good way to communicate as you can see the person who you are talking to as well as its environment*** (1). However, four participants still had technical problems with the connection: *"I tried to call someone and it was ringing then suddenly it stopped working."*

In the **fifth week** more than half of the participants had a positive experience with the Meet format (5). One participant indicated that calling somebody worked a bit better now. Another person indicated that it is a ***great presence when calling somebody***. Moreover, two people enjoyed calling someone, as it was ***fun to see the other person*** (1), and to get to know the others (1). During this week five participants had technical problems. They got disconnected or the connection to another person did not work at all.

Club – Games

In the **first week** only one participant reported on his/her positive experiences when playing Bubbles and indicated that it was ok. A participant criticized the text with the rules about the games and stated that it is very blurry. Another person indicated that the games should have more meaning.

In the subsequent week (**week 2**) two participants indicated that they gained positive experiences with the games, pointing out that the games are very simple (3). *"It is nice to be able to play this simple game together with friends."*

In the **third week** it seems that only two people used this format. These participants indicated that the games worked well (2). One person criticized that the communication did not work properly.

In the **fourth week** two participants indicated that the game Ludo worked without any technical problems. However, half of the people had technical problems, in general. There was a delay in picture and sound (2) or the sound was choppy and disappeared after a while. One participant experienced the game as follows: *"I played Bubbles and Ping-Pong, both games are very simple and they did not inspire me."*

In the **fifth week** three participants had rather positive experiences when playing the games. They indicated that it was fun (1) or that the games were ok (2). Nevertheless, one person indicated that the game Bubbles is far too easy to play. *"Ludo is Ok but Bubbles is much too easy and it doesn't give you anything back!"* Again, they had technical problems, e.g., with the sound (1).

Club – Explorer

In the **first week** one participant indicated that it was fun to read the news via the YoooM. Another one tried the Explorer alone and found it ok. Nevertheless, one person criticized that it takes a lot of time to move up or down. One participant experienced this format as follows: "*This is really just the internet.*"

In the **second week** one participant said that s/he liked that one could learn things together since s/he is most of the time alone at home. One participant indicated that he/she rather read the news on the computer than on the YoooM as it is easier. Another one experienced a bad connection when using the Explorer.

In the **third week** two participants had positive experiences when using the format. *"Good to read several newspapers via the YoooM."* However, two people had problems with the synchronization of sound and video (sound or video disappeared during the usage).

In the **fourth week** one participant indicated to read the news in the Explorer. As a recommendation for improvement a person suggested to provide more news sites. One participant had problems with the video.

In the **fifth week** two participants read the news and indicated that it worked well. One participant had problems with the sound and thus, had to speak via the regular phone.

Club – Excursion

In the first week, one participant indicated that is interesting to have the possibility using a map on the YoooM. The statement of one participant should illustrate this: "*I like maps, this was exciting.*" Only one participant pointed out that s/he disliked the keyboard because it did not work well.

In the **second week,** three people indicated that they used this format together. The "search function" (searching for a certain city) worked well (1) and it was fun to use it (1). One participant used this format alone: "*This is nice to use even if you are alone at the table.*" Nevertheless, some people had technical problems as the picture and the sound disappeared as well as the keyboard did not work properly (3).

In the **third week** two participants indicated that it worked well (1) and it was fun to use the Excursion (1). Two people remarked some problems: "*The overview is good but it is really difficult to get everyone to see the same thing.*" And "*It is positive when it works but it did not work for a long time. Same problems as before, sound and picture.*"

In the **fourth week** some participants indicated their positive experiences when using the

format (3), pointing out that it was fun to talk about what one could see (1). Two participants had problems with the synchronization of the video. A person stated that moving the map sideways did not work properly and the sound was choppy (1). Another participant experienced this format as follows: *"Hard to get to the 'target-place'. Not good for a person who is tired or old."*

In the **fifth week** two participants indicated that it worked well. One participant reported on her/his experiences: *"I looked at Denmark with myself. It worked really fine; I could see where my family and friends live."* One person indicated that she/he still did not figure out how this format works. Some participants again had technical problems (2).

Classroom

In the **first week** the participants held a book circle in the classroom and indicated that it was *nice to talk in a group* (3). Two participants mentioned delays between the sound and the video. Therefore, some people indicated that it is hard to know when it is the person's turn to speak (2).

In the **second week** some participants reported on their activity about a flood in Arvika (3) and indicated that it was *interesting to speak with the others* about this issue: *"We had a class about the big flood in the year 2000: Nice to share experiences."*

Several people had technical problems when using the classroom format (5). The synchronization between the sound and the video did not work (3) and thus, it was difficult to know when to speak (1). *"It worked for 30-60sec, and then the sound disappeared. I had to restart it over and over again. At the end neither the on nor the off button worked."*

In the **third week** three people experienced this format in a positive way. One participant indicated that it was *fun to see the others and to be able to communicate with hands* as well. Another one *enjoyed seeing the other people while talking to them*. However, certain people criticized that the sound was not working properly (4). *"The sound comes and goes. Hard to know when you can talk. Everybody talks at the same time or everybody is quiet."*

In the **fourth week** some participants said that they made positive experiences when using the Classroom format (5). The people indicated that it was *nice speaking in the book circle* as well as listening to the class about a famous painter. However, almost all participants had technical problems with this format (7). The picture and sound were not synchronized properly and the sound was choppy or disappeared. *"Class about a famous painter: the picture was good, the activities are good but technical problems made the overall impression negative."*

In the **fifth week** at least three activities were carried out in the Classroom format. Although all participants experienced technical problems they enjoyed interacting in the group (5). *"In spite of technical problems I still experience this activity to be very positive."* and *"It is very good having the opportunity to resize the pictures of the people taking part in the conversation."* Very useful if you want to listen to someone else."*

Again, the synchronization between video and sound is not working properly and the sound or picture disappeared sometimes. Two participants reported on their problems within the classes: *"It has been difficult to hear and talk when we are many. TECHNICAL problems prevent natural conversation. It seems rather forced."* And *"Hard to hear and understand what the others are saying when the first syllable in the word disappears. Not everyone could see the pictures at the same time."*

Summing up, participants were most positive towards the Meet and the Classroom format. Although they reported about the variety of technical problems that occurred when trying out the Meet format, they liked that it was easy to communicate with each other, that one could see gestures and not only the face and experienced it as a good way to communicate with each other.

They liked the games in general, but reported that for example, the Bubbles games were too easy and thus not that much inspiring. Only a few participants tried out the Club (games, Explorer, Excursion) and in general liked the idea but also experienced a lot of problems.

It seems that participants had the most positive experiences when trying out the Classroom format and liked the idea of joining group activities where they could see the other communication partners and where they had the possibility to illustrate/show something to them.

RQ10: To what extent does the YoooM evoke computer anxiety?

Three items were used in order to assess computer anxiety. All participants who responded to the given statements in week 2 (missing=2) as well as all participants in week 6 agreed to all given statements. We can therefore conclude that the YoooM does not evoke computer anxiety.
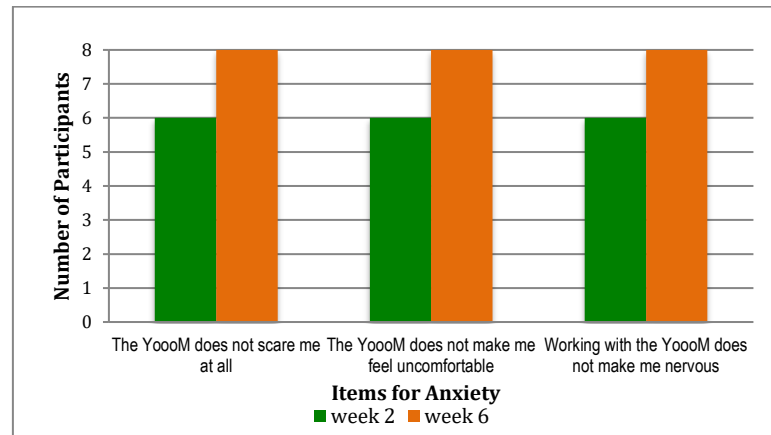
Figure 13: Statements for Anxiety – agreement week 2 and 6

Summary: Emotional value

Summing up, most of the participants enjoyed that one could see the communication partner, having the possibility to recognize gestures. Participants stated that they enjoyed being part of activities provided via the Club and Classroom format and that it was enjoyable for them to exchange knowledge.

Dislikes when using the YoooM especially concerned the technical problems that occurred (internet connection, bad sound and video quality). On the other hand participants liked that they could hear and see the other person and could experience a kind of presence. Concerning computer anxiety, all participants (considering that in week 2 only 6 out of 8 answered the questions) indicated that they do not experience anxiety when using the YoooM.

3.6. Additional Insights

In order to gain feedback on the methodological approach, participants were asked about their experiences when working with the diary and if they have got suggestions form improvements.

Experiences when working with the diary

Participants of the study pointed out both negative and positive experiences when working with the diary. One person indicated that it was *time consuming* and s/he did not like this. But on the other hand s/he notes that s/he understands that it was important to gain information throughout the study. Two persons pointed out that they *did not like that some questions were*

asked several times. Another person explicitly pointed out that s/he *liked working with the diary because s/he experienced the questions as helpful* to reflect on one's experiences. One participant stated that s/he had never worked with a diary and does not have any opinion about it and finally another participant was worried because s/he could not put that much effort in it s/he wanted to because of some personal circumstances.

Participants only mentioned a few problems they had when working with the diary. Two participants stated that some questions were difficult to understand and could be interpreted in several ways. Two persons said that it was important to write down everything straightaway; otherwise they had difficulties to remember all their experiences. One participant indicated that s/he had difficulties to write his/her experiences down, finding it difficult to bring the information from the head on the paper. Another person experienced that the structure of the diary was somehow difficult to understand and made it hard to write everything down.

Suggestions for improvements

As already pointed out, there were a lot of technical problems throughout the whole testing period. Thus, five participants pointed out that improvements are required concerning the sound and picture quality (e.g. for one person the screen was too bright). Moreover, participants pointed out that it is important to solve connection problems and that the system needs to react faster. Moreover it was suggested to provide a kind of memory function (2) in order to recognize if one has missed a call, to provide a way to show if one wants to talk in the classroom (1) and also to indicate who is talking at the moment (e.g., by highlighting the picture of the person who is talking). Moreover, it was suggested to provide an opportunity *(the participant suggested a room or notepad)* to find other user one could contact via the Meet format or to talk or play games. Besides, two participants said that they would wish for more challenging activities (e.g., games).

General remarks and open issues

Overall, although there were a lot of technical problems none of the participants dropped out of the study and participants were quite creative in searching for solutions to solve their problems. When the sound was not working for example participants used post it's to write on it what they wanted to say. Moreover, at least two participants connected a mouse to their YoooM, pointing out that it was much easier to use a mouse than the touchscreen. One participant was a little irritated/annoyed when recognizing that one could use a mouse and said to the care giver *"Why didn't you tell me that in the beginning? That would have been*

much easier!"

Another very interesting issue that came up during the study concerned the Classroom format. Some participants' experiences difficulties to follow a conversation because it was not indicated who is talking at the moment and one could not easily raise the communication partners' awareness that one wants to say something. One participant pointed out *"I do not have the strength to listen to this anymore. There are so much noises when people are talking and I cannot keep track anymore."* This participant left the conversation. Especially, when designing for older adults we identified a need to make it easier for them to follow and take part in a group conversation.

3.7. Technical Support

The general description of the organization of the field test is presented in [1]. The technical support was organized as follows: UCY coordinated and provided second help desk with the assistance of PRE. The technicians of Arvika Municipality provided the first help desk and reported directly to UCY and PRE for any incident, issue or problem during the field test.

3.8. Technical support results

In the following section we provide the results of the field test related to the technical support. First we provide a general overview of the technical conditions of Arvika. Then, we present a summary of the technical problems observed during the field test at Arvika. Finally, we give a more detailed description of these problems, as well as the way they were tackled. The problems are organized in four sections: solved issues, instabilities, open issues, and suggestions.

General overview

The broadband services in Sweden are relatively cheap and with good availability. Most ISPs bundle their services with Internet, IPTV and VOIP. Because of this the end user has to rely on the routers provided by their ISP. This caused some problems at the beginning of the field test, since the YoooM had some issues with NAT. The problems were solved in the course of the field test.

However, not all of our test participants had the recommended 6Mbps we had asked for. Three of the participants had to upgrade their internet connections to get a higher bandwidth so that they could take part in the field test.

Technical Problems – A Summary

The technical problems, observed during the field test in Sweden, were addressed by the technical team (UCY, PRE, BME) in close collaboration with the technicians of the Arvika Municipality. In the following we provide a summary of these problems, while a more detailed technical description follows.

Module issues

During the field test, some minor instabilities were identified, which had to do with the sound, as well as the synchronization between the users, which nevertheless occurred only once. Other instability issues were relevant to the Club format and the BBB server, which permitted the simultaneous participation of more users than the maximum number permitted in a single session (instead of allowing only 4 users, it allowed five). During another instability occurrence, some users unexpectedly exited from the session. Moreover, server problems, during which none of the users could connect to the YoooM Community, appeared. Pixelated videos in the Meet format were also an issue which the technical team had to address.

A critical, difficult to spot, but easy to solve problem was that in one occasion the end user was expected to press a button "allow" in the upper screen for permitting Flash to use his/her camera and microphone every time he/she joined the Club or Teach sessions, which nevertheless was not possible to do because in the upper screen no mouse control exists. The user was expected to do so due to the intervention of another program installed in the system (but irrelevant with the YoooM system), which was clearing the cache after every browser session, causing the browser to keep asking from the user to repeatedly "allow" Flash to have access to his/her cameras and microphone.

During a synchronization problem that occurred during a Teach session, the participants could experience up to 5 seconds delay between sound and video (first the sound was received and 5 seconds later the corresponding action in the video was shown). As a solution, the video camera capturing settings of the BBB server were changed and adjusted so that the synchronization problem disappeared.

Another important issue was the camera initialization problem in Club sessions: the cameras were not always being initialized successfully, causing one of the two cameras of some participants to not being displayed. The only solution for this was that end users exit and rejoins the Club session. A similar problem also appeared in the Meet format, which was solved by adjustments in the software, by restarting the call when one of the cameras failed to initialize.

Network issues

An important network issue was that the technicians had to upgrade the Internet connection at the end users' premises so that the system functions properly (some users had Internet connections with very poor bandwidth, causing failure to system operation). Other problems had to do with the audio in BBB being intermittent in Club and Teach sessions due to packet loss in the Internet connection, since the user had a CDMA Wireless broadband connection, which was not efficient when used with the YoooM system.

Moreover, Meet sessions were taking too many trials to connect due to network traffic, while port disconnection problems were causing the Teach format to not start in a particular device.

Also, in the Club format (Explorer sessions) a synchronization problem occurred due to the fact that network traffic messages was lost. This issue caused confusion to the users.

Issues related to the End Users

An important issue was that at some occasions, the end users were keeping their YoooM units off for personal reasons. Therefore, the particular device could not be accessed for maintenance and update purposes by the technical team.

In the following section we provide a detailed description of the technical problems, as well as the solutions that the technical team provided.

Technical Problems – In Detail as Recorded by the Technical Team

Instabilities

Machine: autotest9a

Status: One-time sound problem during Club session

Description: During a session with end-users the audio was lost in the conversation. They had to restart the software/YoooM to solve it.

Solution: The problem could be solved, by adjusting the sound settings.

Machine: autotest9a

Status: One-time sync problem during Club: Excursion session

Description: The map didn't show the same thing all the time. For example: I was showing the city Valencia. So I searched for it and then zoomed in. This was Ok and everyone saw the

same thing. Then I used the arrows to go up/down and left/right and then the participants' pictures only followed my directions ever other time. This made it very strange because we thought we saw the same but we saw different parts of the city.

Solution: The BME has solved this problem with server changes. The server stores the track of the steps from the beginning. So if the clients saw a different picture they could resynchronize the common status on the map.

Machine: all (not machine specific problem)

Status: Instability problems with the Club: BBB.

Description: During a Club: Explorer session, it was possible that 5 participants joined a session, which can only support 4 at the same time. It was still possible to hear each other, but no one could see its own picture.

Steps:

- Three users were already talking. When Y2 tried to enter, she/he took the empty place in his/her device, but regarding the other devices, she/he took the spot of their own picture.

- When Y2 entered, everybody saw the other 3 users, not their own picture and then there was still available space.

- Then Y5 entered in the 4th place. Everybody could see the others (4 pictures) but not his/her own picture.

The excursion activity was working ok.

Solution: UCY looked into this problem and fixed it to completely avoid this situation to happen again. The problem is solved.

Machine: all (not machine specific problem)

Status: Users get kicked out of a Club activity

Description: During a Classroom session Y2, Y8 and Y17 gets "kicked out" all of the sudden. At different times during the session, it says "Setting up video link" and then we got back to the start page and could re-enter the Classroom. This never happened to so many people at the same activity.

Solution: UPDATE. 04.03.2013. The video quality was reduced in Teach format in order to reduce requirements to server. The technical team decided to wait to see if this issue is present in future field tests as well.

Machine: all (not machine specific problem)

Status: The busy-tone sound is heard in the YooomRTC software, even from the user, who is busy.

Description: When a user was involved in a Club/Classroom activity, she/he is considered as busy for a call via the Meet format. In the normal scenario only the user, who is calling the busy user will hear the busy-tone; however in the system even the user who is busy could hear the busy-tone.

Solution: PRE changed the software, as this was a bug in the system. A new version was installed without this bug.

Problems

Machine: all (not machine specific problem)

Status: The peer-server was down for 3 hours approximately. None of the users could connect to the YoooMCommunity.

Description: Users were not able to connect to the YoooMCommunity because the peer-server was down.

Solution: The technical staff of the EUO switched the units to the server installed in Arvika. Omar started the peer-server as a cron job to restart it in case it fails.

Machine: autotest7a

Status: Offline.

Description: Y9 was offline, the internet was upgraded but the machine was not back online for some time.

Solution: EUOs had to contact the end-users several times to get the unit back online. It was solved by EUOs technical staff.

Machine: autotest3a

Status: Video pixelated in meet.

Description: In a test via Teamviewer the quality of the video in the Meet format was bad.

Solution: Arvika assessed the quality in a real-life conversation (without Teamviewer) by including a session within the Meet format with the user. UPDATE: The test was done and the perceived quality was "not great but it wasn't that much worse than the others either."

Machine: autotest6a

Status: Offline.

Description: The user had personal problems and turned the unit off. However, there was a missing configuration in this unit. The displays should go off after 30 min, but the PC should never go to sleep.

Solution: We have followed the configuration steps in the Installation Manual section 3.1 "Power Options" and configured the unit. UPDATE: The unit is back online. Problem solved.

Machine: autotest1a

Status: Settings for camera/microphone privacy are deleted.

Description: The user had to press "allow" for permitting Flash to use his/her camera and microphone every time he/she joins the Club/Classroom. This was not possible because in the upper screen there was no mouse control.

Solution: Software called CCleaner was installed in this unit and it was clearing the cache on every browser session. The software was un-installed and now it is working fine. All the units in Arvika have been checked and CCleaner has been uninstalled.

Machine: all (not machine specific problem)

Status: Audio and video is not synchronized in BBB

Description: The participants during a Classroom session experienced up to 5 seconds delay between sound and video. They received the sound first and 5 seconds later the corresponding action in the video was shown.

Solution: First, a quality test was conducted between PLUS, PRE, BME, and UCY. The settings of the server were changed and the video/audio quality was assessed and recorded in videos for future analysis. This is the technical information of this change: *camQualityPicture* from 87 to 80 and then to 70: this is the most important variable that adjusts the video quality.

a. At 87 (the original value) it introduces latency of 3-4 sec according to Omar, but the video quality is excellent. This is how the system used to work until now.
b. At 70 the latency drops down to 0.5 sec according to Omar, which is very good for user interaction but the video is a bit pixelated.
c. At 80 we have latency of 1-1.5 sec but video quality is sufficient.

Machine: autotest2a

Status: Audio problems due to CDMA WIRELESS BROADBAND CONNECTION

Description: Audio in BBB is intermittent in Club/Classroom. This is caused by the packet loss in the internet connection; the user had a CDMA Wireless broadband connection, which is a link with packet loss and latency too high for our system.

Solution: The user should connect to a wired internet connection. Otherwise we will have these sound issues continuously. UPDATE. In the meeting with EUOs and PLUS, it was decided to continue with this user but if it is too much hassle Arvika should stop the field test with him.

Machine: autotest1a

Status: Meet takes too many trials to connect

Description: A connection from Linnea (Y17) to Agneta (Y12) could not be established.

Solution: This was an issue related to network traffic. The problem was not fully solved in Arvika. It was fixed until the field test in Sensire. PRE included multiple acknowledge and redundancy messages in the software to ensure proper messaging between units when there is high traffic in the network and messages are lost.

Machine: autotest9a

Status: Disconnection on 8888

Description: Classroom does not start always in Y17. The system got disconnected on port 8888.

Solution: Checking with admin of firewall of Arvika and VPN admin of BME, this problem was not totally solved, as the network administration in Arvika was very strict. A workaround was made in the CVN system to reconnect even with disconnection happens.

Machine: all (not machine specific problem)

Status: Using the Club: Explorer had some user experience drawbacks. This problem affected all the units.

Description: 1. Due to the fact that network traffic messages were lost, some users lag behind with the synchronization. This caused confusion in the user who was left behind because he/she could not see the same thing as the rest. 2. The Club: Explorer session started always in Budapest, which caused again confusion if the user did not know how to see what the rest

could see. The other participants should move with the arrows to allow a synchronization operation to be performed.

Solution: A new feature was implemented to the server. All of the map-steps was saved to the server addicted to a room on the server. So if the new client logged in to the room, then the server sent the latest steps on the map. So the new client went to the right picture on the map with this new function.

Machine: all (not machine specific problem)

Status: Instability problem with BBB. Error message: "bad connection" appears in the screen and the session was paused.

Description: In a Classroom activity all of the YoooMs got a message saying something like "bad connection". The screen turned "foggy-white" and a button with "OK" appeared. The message was shown in the middle of the lower and upper screen. When I pressed "Ok" the message seemed to disappear on all the YoooMs. This happened twice.

Solution: UCY has removed the foggy screen effect and the error message with the "OK" button and replaced them with an error message that does not prevent user actions and meets the requirements of the BBB Module's error mechanism

Machine: all (not machine specific problem)

Status: Camera initialization in Club did not work all the time

Description: On 7.03.2013 while playing Ping-Pong with YoooM13, Y19 couldn't see the participant in the upper screen, though he/she could see and hear us. YoooM 19 took place first at the table. We tried to restart the game several times but this didn't work. After leaving the game and taking place a second time at the table, it did work fine. This issue appeared a second time: During a Club/Ludo session with three participants (Y3, Y15 and Y19) only 2 participants saw each other and played the game (Y15 and Y19), while the third (Y3) took place at the same table because he/she saw our pictures at the table but it turned out that he/she was playing a solitaire game. So there was no connection between the one and the other two. The same solitaire problem repeated with Y15. - This issue appeared a third time: During a Club/Ludo session with three participants we were playing a game with three but could only see two participants (Y3 and Y19) in the upper screen, while the third (Y15) participants could hear us only.

Solution: The only solution for Arvika users was to leave and rejoin the Club.

Machine: all

Status: Camera initialization in Meet did not work always

Description: The camera initialization did not work always in Meet format. Sometimes the peers could listen to each other, but the peer, whose cameras were not properly initialized, was not seen by the others. This was confusing for the users. This was observed first on 23.03.2013 in one of the units (Bianca.Y3) but it was reported on the 11th of March.

Solution: The only solution was to hang-up and call again.

Machine: all

Status: Debug assertion message when the software crashed kept the software in a non-functional state.

Description: When the software presented a DebugAssertion, a popup window was displayed and the software was not closed and initialized.

Solution: This was a problem due to high latency messages, which caused some threads depending on this information to cause the assertion. It was fixed by adding a lock to the thread that was waiting for the message, to avoid other thread would use a resource until it is completely handled.

4. Conclusion

Summing up, although there were quite a lot of technical problems throughout the whole trial, participants were positive towards the device and enjoyed that they could see their communication partner almost life-sized when using the Meet format.

Based on the data we can conclude that the system provided interpersonal value for the participants as they experienced social presence and felt connected via the device.

With respect to the functional value, they experienced it as useful, easy to learn, stated that it is beneficial for them and could assist in conducting activities with other people. Moreover, participants did not experience any anxieties and enjoyed the communication especially via the Classroom and the Meet format.

Since Arvika had the focus point on building communities through YoooM interaction none of the participants new the others from the start. This made it harder for the participants to take contact with each other. I learned that the best way to get them to know each other was to schedule a lot of activities were I was responsible and with that had the role as conversation leader. This made it easier for the participants in the beginning since I always kept the conversation going without embarrassing silences or pauses.

Another thing that made the field test easier was that we had meetings in real life too. Then we could discuss the participants' likes and dislikes, schedule more appointments and get to know each other a bit more.

It was very important that the participants understood that the YoooM device they had at their homes were prototypes and that the field test was a pilot. Otherwise we would have lost their interest very early due to the technical problems that arose. During the field test the participants got reminded several times that the test was a pilot with a prototype and not a test of a finished product.

From our perspective the strengths of YoooM is that you can communicate with several people at the same time and both see and hear them. Another strength that we see is that the screens are big and therefor you can get an almost life-size picture of the one you're talking too.

To get the YoooM to be really good some changes that are essential from our perspective. All the issues at the field test needs to be fixed. The games must be evolved and the response of the touchscreen needs to be better. It's necessary that there is a function showing missed calls. The classroom needs a few changes so that it's easier to have a conversation; something that shows who is talking and an agenda.

5.References

[1] CVN deliverables D6.2. A process guideline document for the field tests