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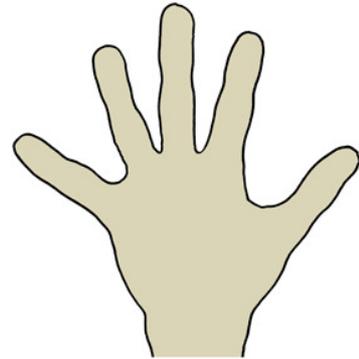
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Summary: This document presents the results of the evaluation and testing of the HANDS ICT Tool Prototype 2 from the perspective of persuasive technology.

It includes a presentation and a discussion of an evaluation based on a number of user interviews. It also includes an analysis and a discussion of the data from the HANDS server.

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Table of content

1. Introduction

In the following we shall first of all present the experiences and the evaluation of Prototype 2 of the HANDS toolset based on the various interviews and observations at the four partner schools in the project. This discussion is based on ideas from persuasive technology (PT).

The most important aspect of the process is the decision to involve the users (in particular the teachers) even further in the development process. The HANDS consortium has put very much emphasis on this.

In sections 2 and 3 we shall discuss the evaluation and the experiences regarding Prototype 2 of the HANDS toolset as seen from the PT perspective. In sections 4 and 5 we shall present and discuss data stored on the HANDS server.

Chapter 2 and 3 have mainly been written by Henrik Schärfe whereas the chapters 4-6 mainly have been written by Morten Aagaard. Peter Øhrstrøm has contributed with various comments and suggestions to all chapters in the deliverable. Pernille Lepianka and Ulla Victoria Bulwan have contributed as interviewers, and they have also contributed with some comments and observations used in chapter 2 and 3.

In section 6, the work in the User Participatory Design Group (UPDG) will be discussed. One of the important aims of this work has been to make sure that the values from everyday school life are brought into the discussion of the HANDS toolset. This way the ideas of value sensitive design are put into practice in the HANDS system development process.

2. User Interviews and Observations Regarding Prototype 2

The Prototype 1 was evaluated from Nov. 2009 to April 2010. The evaluation gave important input to the User Participatory Design Group (UPDG) in which the various suggestions regarding Prototype 2 were discussed. This input made it possible to ensure that there would be a significant influence from the schools on the development of the new prototype.

Prototype 2 was ready for use in the beginning of October 2010 and since then it has been tested and evaluated from three different perspectives.

The persuasive technology evaluation has been based on observations and user interviews at the four partner schools. In the following we shall present a first analysis of these interviews and observations. In the next section we will discuss this first analysis of the data somewhat deeper from the perspective of persuasive technology.

Data for the evaluation of the HANDS Prototype 2 from the perspective of persuasive technology.
There are two kinds of data used for the evaluation of the HANDS prototype 2 from the perspective of persuasive technology:
- qualitative interviews with teachers and students at the four HANDS partner schools combined with observations at the schools regarding the actual use of the HANDS tools
- data reflection user activity - stored on the HANDS server.

Qualitative interviews
The interviews and the observations in question have been made by a team from Aalborg University with the following four members: Pernille Lepianka, Ulla Victoria Bulwan, Henrik Schärfe, Peter Øhrstrøm.

During the interviews with the students, teachers from the local schools have been present whenever the school leaders have recommended this procedure. Henrik Schärfe has instructed the interviewers. The following questions have been asked to the teachers:
- What are your experiences with HANDS?
- Please tell about positive experiences/outcomes.
- Have there been problems/failures?
- Can you show us how you use the system?

The following list of questions has been used as a guide for the interviews with the students:
- How long have you used HANDS (PT1 – PT2)
- Can you show us HANDS on your phone
- Which functions do you use?
- How often do you use the functions?
- Where do you use HANDS?
    o School
    o Home
    o Elsewhere
- Do you talk with others about HANDS?
- Do you use your pone to other things than HANDS?
    o Calls/text messaging
    o Games
    o Video
    o GPS
- If you were to make your own HANDS phone, what would it look like?
- What is good and what is bad about the HANDS tools?

At the Helen Allison School the students were also asked to reflect on the use of social media and the possibility of including special kinds of social media in the family of HANDS tools.
This topic was also raised at Autism Foundation, where a special section about social (use of) media was included, to shed light on the possibilities of establishing the SPo.

Question guide (used at Autism Foundation):
- For how long have you used HANDS?
- Can you say three good things about HANDS?
- Can you say three bad things about HANDS?
- What features do you use in HANDS?
    - HIPD
    - SSSI
    - PT
    - Others
- Can you show me how to use HANDS on your phone?
- Where do you use HANDS?
    - Home

- At school
  - Elsewhere
- Do you talk with others about HANDS?
  - If yes - who? (Family or friends)
  - If no - why not?
- Do you have a Facebook profile?
  - If yes - what do you use it for?
  - If yes - how often do you use Facebook?
  - If no - why not?
  - If no - would you like to have a profile? Why / why not?
- Could you imagine talking about HANDS on a social networking site like Facebook?
  - Why / why not?
- Do you use your phone for anything other than HANDS?
  - Calls / texting
  - Games
  - Video
  - GPS
- Do you use more than one phone? (One for school and one at home)

It has not been possible to ask all questions to all students. The interviews have been organized as free and relaxed as possible. The students have been asked to bring their phones, and they have been asked to demonstrate the tools implemented on their phones.

Each interview lasted typically 30 minutes. In most cases there are audio recordings from the interviews. However, in some cases the interviews have only been documented by the interviewer's written notes.

The following interviews have been made:
    Interview with 1 teacher at Egebakken, Aalborg, Denmark
    Interviews with 3 students at Egebakken, Aalborg, Denmark
    Interviews with 4 teachers at Svedenskolan, Stockholm, Sweden
    Interviews with 4 students at Svedenskolan, Stockholm, Sweden
    Interviews with 2 teachers at Autism Foundation, Budapest, Hungary
    Interviews with 2 students at Autism Foundation, Budapest, Hungary
    Interviews with 10 students at The Helen Allison School, England

At The Helen Alison School the interviewer also participated in a general meeting for teachers and in a meeting for parents. These meetings added to the general observations made during the interviews.

Data from the HANDS server
In addition to the qualitative interviews with teachers and the students at the partner schools some of the data from the HANDS server have also been used in the discussion from a persuasive technology perspective. In principle all the students HANDS activities on the phones are stored on the HANDS server. For the present purpose we have extracted data concerning the use of the various HANDS functions in order to obtain an overview of the use of the tools.

Interview with a teacher at Egebakken

	General data and observations	General use of HANDS	Benefits from the use of the HANDS toolset	Criticism of the HANDS toolset
EGE-T1		HIPD PT		CoMe too com-plex. Takes a lot of time to master the program, and figure out the possibilities. Teachers just have to adapt.

Interview with pupils at Egebakken

	General data and observations	General use of HANDS	Benefits from the use of the HANDS toolset	Criticism of the HANDS toolset
EGE-P1	Has been using HANDS Prototype 2 for almost a year.	Overall the pupil is pleased with the HANDS software and enjoys both the personal trainers (PTs) and the calendar. In general, EGE-P1 uses the tools that HANDS provide and especially finds the PTs to work satisfactory.	Ability to personalize the system.	Hard to navigate. Prompts go off at the wrong time.

	General data and observations	General use of HANDS	Benefits from the use of the HANDS toolset	Criticism of the HANDS toolset
EGE-P2	Has used HANDS prototype 2 since winter 2010.	Prompts PTs	The HANDS software helps the pupil to remember all sorts of tasks throughout the day. P2 uses the PT in particular, reminding him to stay positive and to think about what makes him feel happy and good about himself.	On the downside, the pupil mentions that the smart-phone reacts relatively slow and that it can be frustrating in a situation when you need help. The quality of the HANDS software, like the colors and pictures, could be better.

	General data and observations	General use of HANDS	Benefits from the use of the HANDS toolset	Criticism of the HANDS toolset
EGE-P3	Has used HANDS PT2 since the summer 2010	Prompts Rewards	The pupil's enthusiasm shines through, when talking about the reward (cake) that comes after reading a success story (PT) the 30th time.	Experiences that the smart-phone is very slow, when turning on the HANDS software, and therefore the pupil easily gets frustrated. Likewise it is a relatively big problem when the HANDS software does not respond or simply freezes.

Remarks: None of the pupils at Egebakken have their daily schedules implemented on their smart-phones (HIPD). The teachers explain it with the constant changes in the pupils' daily activities and also the teachers' attempt

to let the pupils learn on their own personal terms and premises. Also some of the pupils talk about how difficult it is to get to the schedule, for example EGE-P3. They get frustrated and embarrassed, mainly because the smart-phone is slow in comparison to what they find acceptable. All of the pupils find the smart-phone outdated and therefore have more than one smart-phone. For example the phones cannot connect to the Internet and the resolution is poor. Also some pupils have a hard time opening the HANDS software.

Interviews with teachers at Svedenskolan

	General data and observations	General use of HANDS	Benefits from the use of the HANDS toolset	Criticism of the HANDS toolset
SV-T1	Assesses that he has failed to make good use of HANDS with the students	Participated in PT1 and PT2. Mainly calendar use. Hard to motivate current students. No apparent use for PTs or social stories	Convinced of future possibilities Wants to move towards more pupil oriented use Comments on mobile usage of time planner e.g, for excursions.	There are some technical problems. The phone freezes. Takes far too long to use CoMe

Remarks: The lack of success seems to stem from a combination of technical issues and pedagogical considerations regarding the pupils in question. Especially the experience that CoMe is slow in use seems discouraging.

	General data and observations	General use of HANDS	Benefits from the use of the HANDS toolset	Criticism of the HANDS toolset
SV-T2	Very engaged in the project. Emphasizes cooperation with parents. Skilled technology user. Difficulties with problem solving regarding the system.	Participated in PT2. Time tables Prompts – both on and off school grounds	Extends the teaching beyond school hours Phone use leads to positive social effects for at least one pupil	Some prompts did not work. Led to low confidence in the system Some instructions were difficult to remove. They lingered even after synchronization.

Remarks: Skilled and engaged teacher who actively reflects on many aspects related to technology use concerning the pupils. It would seem natural to incorporate reflections based on system generated reports and main functions in CoMe, but that does not seem to be the case.
Although technically apt, problem solving seems to be a big issue.

	General data and observations	General use of HANDS	Benefits from the use of the HANDS toolset	Criticism of the HANDS toolset
SV-T3	Engaged in the project Actively reflecting about pedagogical practice Seems technically apt Strong user	Participated in PT1 and PT2. Time tables Prompts Social stories, PTs Text based conversations	Emphasizes the combination of paper and electronic aids in the class room	CoMe far too slow for daily use Strong improvements in PT2

Remarks: Seems to benefit a lot from interacting with other teachers in the program.

	General data and observations	General use of HANDS	Benefits from the use of the HANDS toolset	Criticism of the HANDS toolset
SV-T4	Engaged in the project Actively reflecting about pedagogical practice Seems technically apt Strong user	Participated in PT1 and PT2. Time tables Prompts Presently no use for PTs	E-versions of instructions always present, and does not get lost Uses HANDS to develop new interventions together with pupils	PT2 CoMe much faster and easier. Still a little slow in use.

Remarks: Moving towards a more cooperative strategy, involving pupils more. There is clearly a growing confidence in the system.

Interviews with pupils at Svedenskolan

	General data and observations	General use of HANDS	Benefits from the use of the HANDS toolset	Criticism of the HANDS toolset
SV-P1	Recently arrived from a mainstream school Quiet student Does not talk to others about HANDS	Participated in PT2. Mainly calendar use. Using reminders about homework Regular use of YouTube, Facebook and games	No strong feeling of benefits. Might be interested in SPo	Would like more possibilities to individualize

Remarks: Based on early successes with the phone aiding him in doing his home work, this pupil shows potential to benefit from the system. At present, only few functions are used. Perhaps more support from home and other sources could raise awareness and motivation.

	General data and observations	General use of HANDS	Benefits from the use of the HANDS toolset	Criticism of the HANDS toolset
SV-P2	Interested in technology	Participated in PT1 and Handroid. Mainly calendar use.	Makes it easier to get up in the morning	n.a.

Remarks. Seems motivated by the fact that he gets a cool phone. Seems aware of the urgency to increase life skills, and is thus motivated to gain more personal freedom. But it seems difficult to connect these wishes with what the HANDS system has to offer.

	General data and observations	General use of HANDS	Benefits from the use of the HANDS toolset	Criticism of the HANDS toolset
SV-P3	Interested in technology	Participated in PT2 Timer PTs (4 active) Rewards General phone usage: Ordering pizza, Youtube, google maps	No comments	Should have svg player and flash9

Remarks: Very apt and interested in advanced technology. Connecting with the HANDS system seems conceptually difficult.

	General data and observations	**General use of HANDS**	**Benefits from the use of the HANDS toolset**	**Criticism of the HANDS toolset**
SV-P4	Phone left at home Phone was missing for a long time Teacher reports that he did not miss the phone	Time table, in conjunction with paper versions	Family reacted positively to the phone	Phone was recovered, but important numbers were missing

Remarks. Overall negative evaluation of the HANDS system. Does not seem to produce any positive effects for this pupil, despite the fact the there is good support from both home and school.

Interviews with teachers at Autism Foundation

	General data and observations	**General use of HANDS**	**Benefits from the use of the HANDS toolset**	**Criticism of the HANDS toolset**
AF-T1	Reflects specifically and detailed on experience with one pupil.	Participated in PT1 and PT2. The Calendar has improved. In PT2 Uses personalized skins with success. Time tables not a good solution for this pupil Paper based systems seem better at school. Social stories with funny pictures.	Good integration of reward systems. The pupil was actively part of making support systems. Ability to use web pictures rather than board maker (which the pupil finds demeaning) Enables to extend the teaching beyond school grounds and school time.	It has been difficult to learn how to use the system despite extensive help from school and the HANDS community. PT2 still slow.

	General data and observations	General use of HANDS	Benefits from the use of the HANDS toolset	Criticism of the HANDS toolset
AF-T2	New teacher at this school. No special interest in technology, but found the project interesting.	Worked on PT2.		Difficult to learn. Much waiting time. The phone freezes.

Remarks: During the interview it becomes evident that the phone enables teaching to stretch beyond the class room and into the social sphere of the pupil.

Interview with pupils at Autism Foundation

	General data and observations	General use of HANDS	Benefits from the use of the HANDS toolset	Criticism of the HANDS toolset
AF-P1	Likes computers Likes phones but not the HANDS application.	Time tables PTs

Social stories with funny pictures | Social stories helped to improve eating habits, and shopping skills. | Not applicable |

Remarks: Believes that he doesn't need support systems – including HANDS. But was motivated to use PT2 because he liked the phone (internet dictaphone). May not bring the phone home. Introduction to advanced technology in the family was difficult. Forgets the phone between classes. Does not use the phone anymore. Does not use social media.

	General data and observations	General use of HANDS	Benefits from the use of the HANDS toolset	Criticism of the HANDS toolset
AF-P2	Uses Facebook, but mainly because of the access to cartoonish drawings.	Uses the phone at school and at home. Likes to take the phone home, and seems happy about it. Takes pictures. Does not text or call, but uses pictures to communicate	Uses a PT to go to the library. Uses a PT to make breakfast to the family Easier to bring the phone around than paper solutions	Not applicable

Remarks: Some task descriptions have been moved from paper to phone. Strong support from home

Interviews at Helen Allison School

The following data are extracted from interviews made at the Helen Allison School on Jan. 25-26, 2011 with teenagers participating in the Prototype 2 test group. Some observations during the meetings as well as some remarks based on experiences from the meetings are also included.

The students were asked to present themselves and their use of the HANDS tools. They were asked to comment on the possible benefits from the use of the system and also on the possible points of criticism regarding the HANDS toolset.

	General data and observations	General use of HANDS	Benefits from the use of the HANDS toolset	Criticism of the HANDS toolset
NAS01	Boy. 15 years old. Appears to be a gifted student. A large vocabulary.	He has been testing Prototype 1 and is now a member of the Prototype 2 test group. He has brought his phone, but when asked he is unable to open the HANDS system on the phone.	He cannot imagine that the HANDS toolset could be helpful for him personally. But he claims that other students may be able to benefit from the use of the tools. He says that it would probably be a good idea to integrate the HANDS toolset with social software.	There are some technical problems. E.g. the phone often freezes when it is running the HANDS tools.

Remarks:
It is obvious that this student has a rather negative evaluation of the HANDS tools. Due to his earlier experiences with the "freezing phone" he has probably lost his confidence in the HANDS systems.

	General data and observations	General use of HANDS	Benefits from the use of the HANDS toolset	Criticism of the HANDS toolset
NAS02	Boy. About 15 years old. Appears to be a gifted student. He is interested in football and computers.	He is a member of the Prototype 2 test group.	He uses the HANDS calendar application every day, and he finds the functionality satisfactory. He has an iPhone which he uses for other purposes. He says that it would be a good idea to integrate the HANDS toolset with social software.	No criticism.

Remarks:
It is obvious that this student has a rather positive evaluation of the HANDS tools. This should perhaps also be seen in the light of his general interest in computers and his experiences from his use of the iPhone.

	General data and observations	General use of HANDS	Benefits from the use of the HANDS toolset	Criticism of the HANDS toolset
NAS03	Boy. About 15 years old. Appears to be a gifted student. His special interest is mathematics.	He has been testing Prototype 1 and is now a member of the Prototype 2 test group. He does not use the HANDS tools very much.	He says that it would be a good idea to integrate the HANDS toolset with social software.	He points out that there are some technical problems. E.g. the phone often freezes when it is running the HANDS tools.

Remarks: It is obvious that this student has a rather negative evaluation of the HANDS tools. Due to his earlier experiences with the "freezing phone" he has probably lost his confidence in the HANDS systems.

	General data and observations	General use of HANDS	Benefits from the use of the HANDS toolset	Criticism of the HANDS toolset
NAS04	Boy. About 15 years old. Appears to be a gifted student. He is friendly, but does not say very much. His special interest is computers.	He is a member of the Prototype 2 test group.	He uses the HANDS calendar application every day, and he finds the functionality satisfactory. He has brought his phone and demonstrates convincingly how a new appointment is made in the system. He says that it would be a good idea to integrate the HANDS toolset with social software.	He points out that there were some technical problems earlier. E.g. the phone often froze when it was running the HANDS tools.

Remarks:

It is obvious that this student has a rather positive evaluation of the HANDS tools. He has had the negative experiences with "freezing phone" as many of the other students in the test group. He has, however, realized that most of these problems have been solved in the later versions of the HANDS toolset.

	General data and observations	General use of HANDS	Benefits from the use of the HANDS toolset	Criticism of the HANDS toolset
NAS05	Appears to be a gifted student. He speaks a lot. He says that he has some social problems. He is interested in cars and computers.	He is a member of the Prototype 2 test group.	He uses the HANDS calendar application every day, and he finds the functionality satisfactory. He has brought his phone and demonstrates convincingly how a new appointment is made in the system. He also demonstrates two PT-systems on his phone: a) "Don't get lost" b) "Bus"-driving problem. ("Don't get angry in the bus.") He explains that these systems are very helpful in his everyday life. He is thankful to his teachers for the production of these tools. – Together with his teacher he is now planning to make a PT (or SSSI-tool) which should help to avoid making racist remarks when he is meeting with other people.	No criticism.

Remarks:
It is obvious that this student has a very positive evaluation of the HANDS tools. He is able to benefit from the use of the calendar functions in HANDS. In addition, his teacher has – in cooperation with him – been able to develop several very useful tools for him. These tools have all been especially tailored for him.

	General data and observations	General use of HANDS	Benefits from the use of the HANDS toolset	Criticism of the HANDS toolset
NAS06	Boy. About 15 years old. He has had several teachers during the last year. This has affected his use of the HANDS system, as it has been difficult to maintain focus	He is a member of the Prototype 2 test group.

Familiar with using both text and photos on the phone.

Enjoys games | Mainly uses the calendar functions. | He has trouble navigating through the software. He has repeatedly lost or misplaced the stylus. This has also caused breaks in usage of the system. |

Remarks: The overall evaluation is mainly negative, and seems to stem from a combination of interaction issues (especially navigation, which seems conceptually difficult) and other issues, such as the change in primary teacher.

	General data and observations	General use of HANDS	Benefits from the use of the HANDS toolset	Criticism of the HANDS toolset
NAS07	Boy. About 14 years old. Reluctant to talk about the phone and the program. The phone froze as he tried to show how he uses it.	He is a member of the Prototype 2 test group.	Mainly uses the calendar functions.	Complains about repeated freeze ups of the phone.

Remarks: Communication is difficult in general with this boy. He doesn't seem to be interested in the phone at all. No signs of internal motivation to use the system.

	General data and observations	General use of HANDS	Benefits from the use of the HANDS toolset	Criticism of the HANDS toolset
NAS08	Boy. About 17 years old. Engages with the phone and the system Good technical skills Very talkative and imaginative.	He is a member of the Prototype 2 test group.	Widespread use of the phone and related systems. Is able to shop online independently.	Complains about repeated freeze ups of the phone. Is annoyed with the stylus. Wants a better Flash player

Remarks: Mainly positive evaluation. The pupil uses the phone both at home and at school and it seems that the system is well integrated into his routines. Traces of internal motivation related to life skills.

	General data and observations	General use of HANDS	Benefits from the use of the HANDS toolset	Criticism of the HANDS toolset
NAS09	Boy.	He is a member of the Prototype 2 test group.	Uses reminders, rewards, interested in personal themes (skins) for the phone. Interested in SPo.	Bad experiences with the phone freezing up.

Remarks: Mainly neutral evaluation. In this case, trust in the system is clearly compromised by freeze ups. One freeze up at a critical time is enough to jeopardize the entire program throw off internal motivation.

	General data and observations	General use of HANDS	Benefits from the use of the HANDS toolset	Criticism of the HANDS toolset
NAS10	Boy. Engages with the phone, but not really with the HANDS application	He is a member of the Prototype 2 test group.	Hard to see	Complains about lacking internet when moving around

Remarks: Mainly negative evaluation of the system. He is interested in using the mobile to watch videos and play games, and displays good understanding of technical aspects pertaining of this kind of usage. Does not appear to be interested in what the HANDS application has to offer.

2. **Evaluation of Prototype 2 based on the User Interviews and Observations**

Clearly, the teachers who have participated in the interviews are very different. However, most of them can easily find potential benefits from the use of the HANDS toolset, as well as they are able to locate practical/technical problems in using the software. The interviewers are left with the impression that many of the teachers actually find it difficult to make use of the toolset in support of their work as teachers. In particular, they find the CoMe functionality very slow, complex and unpractical. This indicates that too little has been done in order to introduce the functionalities of the HANDS toolset to the teachers at the partner schools.

Some of the students clearly found the HANDS toolset useless and irrelevant in their case. They did not believe that these tools could be helpful for them at all. Their main reason for finding it incredible, that the HANDS tools could be useful for them, was that earlier they had some very negative experiences with the tools causing their phone to "freeze".

On other hand, some of the teachers and students (SV-T2, SV-P2, AF-P1, AF-P2, NAS02, NAS04, NAS05, NAS06, NAS7, NAS8, NAS9), have reported a clear potential for obtaining actual benefits in difficult social situations by the use of the HANDS tools. In some cases, like NAS05, this in fact meant a very significant help for the student in his everyday life. In these cases, the use of the tools led to a changed behaviour and maybe even to changed attitudes in certain respects. In this sense, the potential of a persuasive effect has been documented.

There is evidence that the positive persuasive effect can be obtained in the area of planning and management of time (using the HIPD function in the HANDS software) or in relation to personal problems (using the PT or SSSI functions in the HANDS software[1]). The former is a traditional challenge at the schools for young people with autism. (See the analyses of the calendar functionality in HANDS in Ranfelt, A. et al., 2009.) In the latter case the well-known technique of "tunnels"[2] can be used. (See the discussion of tunnels in the HANDS deliverable D4.3.1, 2010.)

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[1] See (Schärfe, H. et al., 2009).

[2] The idea of tunnels was originally suggested by B.J. Fogg: "Another way that computers act as persuasive tools is by leading users through a predetermined sequence of actions or events, step by step. I refer to this strategy as "tunneling". Using a tunnelling technology is like riding a roller coaster at an amusement park: once you board the ride, you are committed to experience every twist and turn along the way. When you enter a tunnel, you give up a certain level of self-determination. By entering the tunnel, you are exposed to information

It seems that this positive effect, in such cases, has been obtained because of a close co-operation between the student and his teacher. These teachers and students clearly found it increasingly *credible* that it would be possible to benefit socially from the use of the HANDS tools.

There are clear indications of the importance of the notion of credibility[3] when discussing what the students and their teachers say regarding the possible persuasive effect of the use of the HANDS software. Some of the key questions will be: "What should the strategy be, if we want to make a user change his view from finding it incredible to finding it credible, that the tools will be helpful?", "How can we avoid that users conclude that it is incredible that the tools will work – in cases where there should actually be good reasons to believe that the tools will work?".

One problem may be that the tools have been introduced to the teenagers too soon in the process. The evidence indicates that users, who have seen the phone "freezing" when using Prototype 1, will be unlikely to believe that Prototype 2 can be of any help.

When asked about the use of social software most of the students and teachers have positive reactions. It seems that they are in favour of the idea of including elements of social software in the HANDS toolset.

Such considerations suggest the following conclusions regarding Prototype 2 as seen in the context of the whole project:

1. There is clear evidence of a potential in the HANDS toolset for helping teenagers with autism in everyday situations which they find difficult. In particular, students may find help in organising the time (using the calendar) and in focusing on various personal challenges (using the personal trainer, PT, or the SSSI).
2. The positive potential in the HANDS software can only be documented if an active and qualified co-operative design process has been established between the student and his teacher.

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and activities you may not have seen or engaged in otherwise." (B.J. Fogg: *Persuasive Technology*, p34)

[3] The notion of credibility is discussed in (Øhrstrøm, P. 2011) and in (Gerdes, A. & Øhrstrøm, P. 2011) ,in which the author focus on the ethical perspectives of the problems.

3. Some students find it incredible that the HANDS tools will be helpful. In some cases this is caused by bad experiences with Prototype 1. Maybe the software has been introduced too early for these students.

4. Regarding the further discussion and analysis of the persuasive effects of the HANDS tools, the notion of credibility is essential.

5. It seems that the need for careful introduction of the HANDS functionalities for the teachers at the partner schools has been underestimated. Much more emphasis should be invested in training the teachers in the proper use of the HANDS toolset.

3. Analysis of data obtained from the HANDS server

In general, it is difficult to do relevant population statistical analysis of data concerning individuals with autism. The reason is thatthey as already mentioned very different. A general statistics will typically contain a variety that ranges from great failures and great success. One of such statistics is the log of the use of the HANDS mobile by the pupils. Every time an interaction has taken place it is logged on the server. Both initiatives taken by the pupil and interactions otherwise occurring on the mobile itself will be logged. Clearly, the server data in question contain important information regarding the user behaviour. The following diagram illustrates the use of the HANDS tools (HIPD, PT and TIn) over a period of about 7 months from November, 2010, to May, 2011.
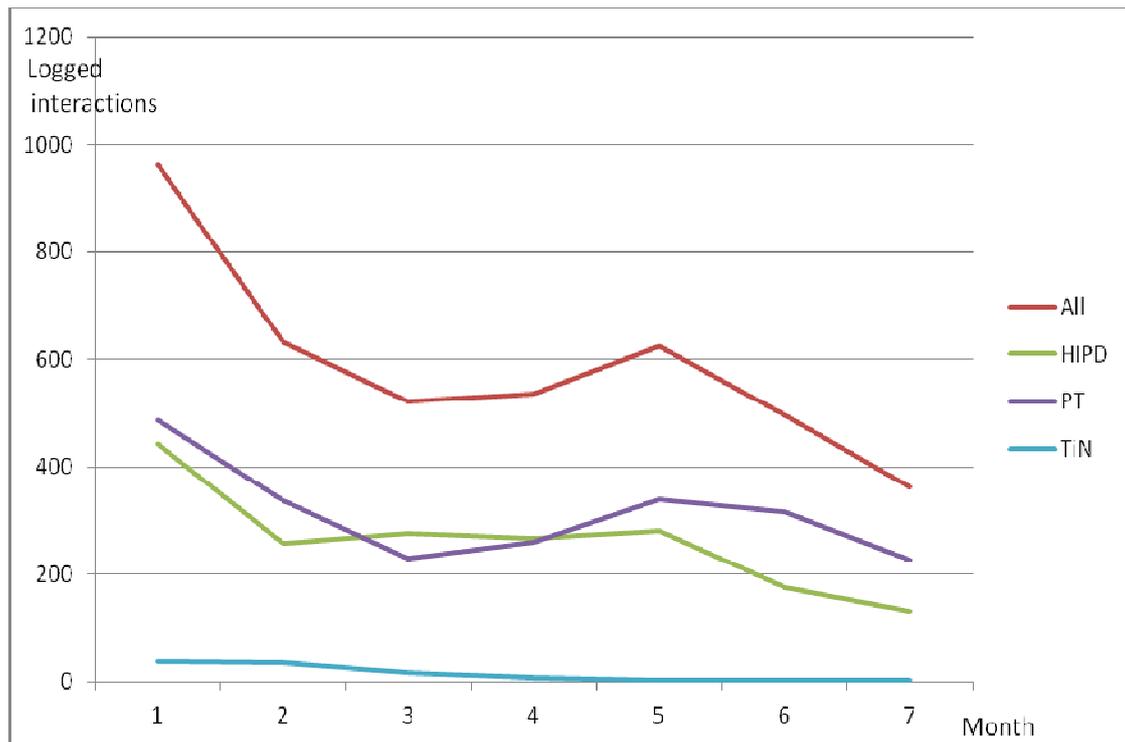
Figure 1. Overall log statistics of Prototype 2 use (from November 2010 to May 2011) by the pupils at the HANDS partner school. The figure includes statistics for 3 functionalities.

HIPD (Handy Interactive Persuasive Diary) interactions are calendar functions - such as seeing, modifying, adding appointments, seeing the day plan or week plan and using prompts.

PT (Personal Trainer) is functionality that covers a variety of pedagogical purposes: support to executive functions, Raising awareness to rewards and how to get them, and teaching affective control and understanding.

Tin (The Individualiser) covers individualization in terms of audio and visiual skin and the use of minute watch.

4. Discussion of the server data

The log results between the 3 functionalities are expected. Using Calendar functions can be a regular everyday activity that generates many log data. The TiN is once in a while when a pupil feel it is appropriate. Obviously, it is a functionality that does not create much interaction and therefore log data. The Personal Trainer (PT) is a focused pedagogical intervention which is usually limited to a time interval or certain activities meaning that everyday use of the single PT not will account many clicks. In this way the general statistics can be explained. The less expected property of the overall statistics is that the use of PT generate more log data than the use of the HIPD. More explanation can be given

- Some pupils have gotten used to HIPD and it is not turned off during the day excerpt when using PTs.
- Some pupils stop using HIPD
- Some teacher starts creating PTs for focusing on special challenges.
- Some teachers create PTs that are being used.

Regarding whether Prototype 2 has been an integral part of everyday life the statistics below is gives a hint.

Month	1	2	3	4	5	6	7
Logged interactions pr work day	2,290476	1,507143	1,242857	1,278571	1,485714	1,180952	0,864286

Table 1 Usage pr pupil of Prototype 2

To be an integral part of the pupil's everyday activity you would expect 2-3 logged interactions pr working days. Which only is the case in the upstart month. But here the introductory comment is in place to bear in mind: these data will probably include pupils that are heavy users and pupils that are not heavy users.

How we turn to some of the unique properties of HANDS: rewards and prompts. Using these facilities has not been mandatory for the teachers/pupils but an option that they could choose to use.
Regarding rewards the profiles of the involved pupils document that reward points have been used by 11 out of 20 pupils. It differs from using rewards 1-2 times to several times and in PTs. But the teachers have found it valuable, and it seems as if it has a kind of viral property: at one school (SVE) almost all pupils have been using rewards. In other words, Rewards can be valuable in the usage of HANDS.

Regarding Prompts - the interactions logged documents that 7 pupils have been using prompts and 3 of these have been "heavy" users (75% procent of the prompt interaction relates to them). All in all 62 interactions! Prompting is an integral part of autism pedagogic, and the prompts that have been used gives an indication of how valuable it can be.
E.g.
QE: "I do hope I do not disturb, but: have you remembered you astma medicine".
A.: "It is already in its box"

QE: "What do I have to remember before I leave?"
A.: "Prepare the plan for tomorrow"

Included in the prompt is a possibility for the pupil to postpone the prompt but that has not been the case for any prompts.

The usage of prompts has not been high, but in the situations where they have been used the usage have had a high quality.

Overall conclusions of the log data analysis is that the number of logged interactions is not are remarkable big, but the numbers do undoubtedly include a large variation. Furthermore, the usage of unique HANDS features has been positive, but not all teachers have used it in their work with their pupils.

5. The work in UPDG

Shortly after the PB meeting in December 2009 the "User Participatory Design Group" (UPDG) was founded. It was formed as an offer to all four partner schools. All four schools have participated as well as the 3 universities, but the core idea was that the users (the teachers) should be heard, i.e. their demands, discussions and questions should be in focus. The UPDG have met once every second week in a videoconference (Adobe Connect) to consider specific topics in which the starting point of the design was the challenges of the schools, caretakers and teachers.

The consortium has asked the UPDG to influence the requirements. The common understanding within the consortium was that the influence on the Prototype 2 should come from the schools more than from the universities – something like 65/35%. This should be reflected in the decision process regarding the formulation of the requirements to Prototype 2. This way it may be possible to create more ownership at schools towards the HANDS toolset. It was also believed that this way the toolset would be more useful.

The UPDG includes teachers who are using HANDS. They have all been using some of the HANDS tools, enabling them to construct individualized persuasive components for their pupils. It is interesting to study what problems, challenges and issues in general are discussed in such a forum.

Data from UPDG group

As mentioned above, the UPDG was formed late 2009 and has been active throughout and up to the end of the HANDS project. The rules of procedure for the work in the UPDG have included a video conference meeting every second week. (However, some scheduled meetings have been cancelled due to lack of current issues.) The rules for procedure also included that minutes were written and this task was carried out by the UPDG participants taking turns.

The minutes have, in most cases, had the form of a record of decisions and the qualitative observations or judgments have been excluded from the minutes. The minutes have been written by the participants and the quality of the minutes varies accordingly: languages skills vary, traditions for writing minutes varies and time spent varies.

Nevertheless, the minutes give an overview of the issues, which have been raised, i.e. which issues have had a prominent place during the discussions in the group. Furthermore, the UPDG has been a positive and constructive group and the minutes occasionally reflect this, as positive and constructive comments are sometimes included.

The purpose of the UPDG meetings was originally to exchange ideas and to function as an eye opener. In the startup phase of Prototype 2, the UPDG had agreed that the participants should present cases of interesting/valuable/innovative use of HANDS. Unfortunately the media used resulted in some constraints on the dialogue. It is challenging for practitioners to communicate in English and a number of culture/school/pupil specific assumptions are not described.

Results

A walkthrough of the minutes from the UPDG meetings give a number of results. The most interesting in this context are the following points:

1. Over 50% of the issues discussed in the meeting were administrative issues: i.e. documentation of tests, documentation for a deliverable, organizing tests, planning next meetings.
2. Stability and software quality in general were returning issues. Not huge issues, but returning issues.

3. Occasionally (3-4 times) it appeared that teachers were not aware of features that are central HANDS features despite the fact that they had been introduced to these features.

   The central features are in this case logging and prompting.

Some single events gave rise to interesting discussions as well.

   A. A pupil had difficulties in having proper sleeping routines

   A discussion on how to support these sleeping routines showed significant differences in integrating HANDS mobile and autism pedagogic. It appeared at the meeting that two schools independent of each other had a similar problem. One school had a sophisticated consideration in which they used autism pedagogical methodology with HANDS while the other just made use of the HANDS mobile without reflection on offline activities. At least that is how the experiments are described in the minutes.

   B. Customized day plan.

   One feature that the UPDG had been heavily involved in was the designing of a customized day plan. The customization included look and feel in quite a number of features as well as the choice of relevant features. When presented at the UPDG meeting, the group members were very excited and tried it out in a number of ways. Unfortunately, the group concluded that using the customized day plan required new skills, new graphical skills.

   C. Reward

   At one meeting a case story about rewards was presented. Obviously, the demonstration was interesting and valuable. The case was rich and easy to follow. The participants were obviously thankful. Unfortunately it has been difficult to register an impact on other practitioners work as a result of the case.

During the UPDG meetings, discussions of cases, in which core Persuasive Terms such as Credibility, Ethos, Kairos had been used, did not occur. Neither did an explicit discussion on how to get started with the mobile phones. Only when the UPDG created tunnels for themselves, these discussions came up, This despite the fact that all teachers were facing the challenge of introducing a new thing to the pupils with an autism diagnosis.

Analysis

The quantitative observations show first of all that the teachers are all very responsible project participants who take their responsibility towards the project as such very seriously. They also take their responsibility as a teacher and caretaker of vulnerable young people very seriously, which means that their worries about software stability and quality should be taken into careful consideration. Using the HANDS software is not a game. Those two observations define the teachers' space for taking action.

The experiments are limited by the twofold responsibility of the teachers. The responsibilities do not call for radical innovative experiments, but rather smaller "safe" experiments.

The single event observations also give some valuable insights. The case where the pupil had difficulties in having proper sleeping routines presents strong evidence for how difficult it is for teachers to innovate their thinking. There may be a number of reasons, which are non-exclusive. The most evident being that the integration of current pedagogical methodology and new technology was difficult and the teachers "forgot" to consider the first part. Another reason could be that the technology was new and the teachers were unsure about how to operate it, how it worked and so on with the consequence that pedagogical methodology got out of focus. A third explanation is rooted in context conditions, like project time constraints or considerations on how this particular pupil should be treated.

All reasons are sound and plausible, and they indicate that innovation of autism pedagogical praxis can be very hard.

"The Customized day plan" case is an example of a design team that actually works centered around the user. The autism pedagogical advices and the teachers strongly support customization, and the teachers in the UDPG actually had made it possible through intensively working with design and specifications. Unfortunately the work had unpredicted consequences – i.e. new requirements to the teachers. These requirements made the innovation of their praxis harder and therefore counter-productive. Again autism teachers can react innovative or "play it safe". Both choices are plausible when taking care of vulnerable children.

The case "Reward" too can have more explanations. The data from the minutes does not include to which extend the reward case actually made the teachers use HANDS this way. But based on our walk-through of the content

of the pupils mobile phones on the HANDS server, it is easy to see the level of use. The opportunity to create rewards this way; rewards, that can be used, can have an impact on awareness on the pedagogical targets - stressing *can have*. When dealing with pupils with autism a number of context issues can have a certain level of impact on the awareness and therefore the behavior of the pupil, that is well-functioning daily routines, reduction of visual or auditory stress, how the pupils are spoken to, awareness on how human prompts are being used etc. The mobile reward is an innovation of teacher intervention with an unknown impact or at least not an impact previously experienced by the teachers.

Conclusions regarding the work in UPDG

The conclusions from the study of the UDPG meetings combined with studies of the HANDS server logs and knowledge about the teachers, make us able to conclude that innovation of teaching practice is very difficult. The result of the work with the pupils is not a part of the empirical data and the effect of the UPDG meetings and work cannot be evaluated, but you can conclude that due to the responsibility of the teachers – working with vulnerable young people - they are less likely to be innovative in regard to new ways of influencing the young people.

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