# Digital Pictures as Cognitive Assistance

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Abstract. Pictures taken with digital cameras have become an alternative and a complement to symbols in communication for persons with cognitive disabilities. We have started a discussion forum on digital pictures on the internet. The postings from the discussion forum were analyzed to see what kind of use of digital pictures that professionals and parents are interested in. To validate the results, an e-mail survey was sent to those who had visited the discussion forum and they were asked how they actually used their pictures. The resulting categories are discussed together with the concepts identity and power for persons with cognitive disabilities.

*Key words: Digital picture, digital camera, cognitive disability, symbol, rehabilitation aid.*

## 1. Introduction

Symbols and images have been used for a long time for people with cognitive disabilities to augment communication and to support memory. PCS (picture communication system) [11] is an example of that kind of system. New technology and digital cameras have given new possibilities. There are many advantages; Photographs have higher transparency, which means that the object referred to is easier to match with the picture, than with a symbol [12]. The pictures show the same reality as the persons have experienced. Digital pictures are fast; you can see the picture on the camera display within seconds. The cost of one picture is the same as that of 100 pictures. This means that you can take as many pictures as you like of the same situation, and then



Figure 1. PCS symbol meaning "Queue"

choose the most relevant ones for you. The possibility of "taking pictures for free" has led to a different use of pictures. Pictures are taken of other phenomenon and are used in different ways. This has not been investigated much so far. One of the few articles in this field is about information capture in working life. The article analyzes what was captured with digital cameras by persons at an office [5]. Our investigation analyses how digital pictures are used for people with cognitive disabilities.

Certec's experience with digital pictures for people with cognitive disabilities started with the Isaac project in 1993 [8, 9]. The project developed a personal digital assistant with features like a mobile phone, a digital camera, GPS, and software for planning and communication support. The opportunity to take many pictures with the digital camera was the feature that the users prioritized.

We think that the user's need should guide the development, so since then we have had many projects involving digital pictures for persons with different disabilities. One user is Gun Andersson [1, 2, 3, 6], who has aphasia and has improved her communication skills with digital pictures. Other projects have involved persons with developmental disability [4, 14, 15], autism [4, 10], and deafness. The latest project has started a discussion forum on the internet for people who are interested in digital pictures [7].

## 2. Materials and methods

The discussion forum is implemented with the conference system WebBoard [13], and has 13 headings under which contributors can post. The language is Swedish, so the majority of users are from Sweden but there are also many people from Denmark and some from Norway. The majority of the persons are either professionals or parents.

An analysis of the postings in the discussion forum was carried out to see what kinds of digital pictures usage were of interest. In the discussion forum there were 757 postings from November 4, 1999 when the forum started, until December 1, 2000. 156 of them were under the topic concerning the use of digital pictures. We used our knowledge obtained from our previous work with digital pictures to divide the postings into different categories. The reliability of the division into categories was investigated by having 25 random selected postings independently judged by two other persons.

We also wanted to know what usage was actually done, not only what the persons in the discussion forum talked about. So we carried out an e-mail survey with questions based on the results of the analysis. The e-mail survey was sent out to the 268 persons who had given a correct e-mail address of the 296 persons that had visited the discussion forum. We were only interested in the answers from persons who had experience of practical use of digital pictures, so the first question was "Do you use digital pictures for persons with disabilities?". Those who answered yes continued with "Yes/no"-questions on the format: "Have you used digital pictures in *this way*?", where *this way* were the categories from the analysis of the postings.

Statistical analysis ($\chi^2$-test "goodness of fit") was made to see if the discussion was the same as what was actually done. The answers in the e-mail survey were also analyzed in the same way to see if they differentiated from random answers.

## 3. Results

The results of the analysis of the postings were nine categories. We are going to list them here (the number of postings within brackets) together with an example from real users of how they use digital pictures in that way. 27 postings were sorted to the 10:th category "unrelated to this investigation". The categories together with the number of postings are shown in figure 2.
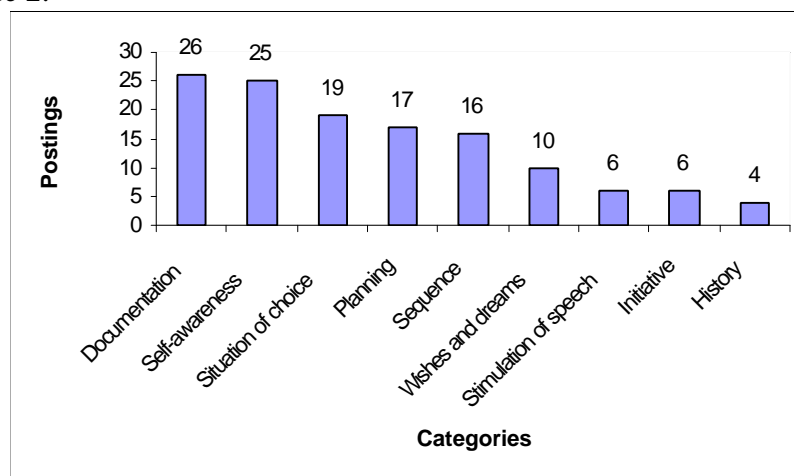


Figure 2. Numbers of postings in the discussion forum.

*Documentation* (26)

> A father to a girl with autism and developmental disability tells that they are doing weekly schedules with digital pictures. They save the used schedules and use them as documentation. The girl likes to sit and look at old schedules by herself.

*Creating self-awareness* (25)

Pictures have been taken of a person with developmental disability when he expresses different feelings. Now he can see how he looks like if he is happy or angry. It's also much easier for him to tell others about his emotions.

*Situation of choice* (19)

At a group-home for persons with cognitive disabilities, they present leisure activities with digital pictures, video sequences and sound on a computer. You can go through the alternatives as many times as you like before you decide. Earlier, when the activities were presented in text and symbols, some persons often regretted their choice after a month, but this seldom happens now.

*Planning* (17)

At a special school in Sweden they were planning a one-day journey to Denmark. They put together a description in pictures of what was going to happen the whole day, and gave to every pupil. The description contained pictures of taxi – bus – train – ferry – little mermaid – walk – zoo – picnic –walk – bus – ferry – train – bus – taxi. The possibility for the pupils to see what was going to happen made the pupils secure and the trip was a big success.

*Many pictures in sequence to tell a story* (16)

When sending a letter with digital pictures to an activity center for persons with developmental disability, showing the backyard of Arne's house with apple tree and rotten apples laying on the ground, we got an answer in 11 pictures showing an appropriate way to take care of the apples. The pictures were from their garden and showed all the steps in taking care of the apples.

*Whishes and dreams* (10)

At an activity center for persons with developmental disability they have tried to make the whishes and dreams easier to talk about. They had pictures of many places, objects and persons, and they could choose places they wanted to visit, things that they wanted and persons they wanted to meet. After that a picture of the person was pasted into the picture. One result was a person sitting in a red sports car.

*Stimulation of speech* (6)

In the same activity center a person started to talk to the pictures. He didn't talk much before, but now he often stands alone in front of a wall covered with pictures, talking about what is happening in the pictures.

*Take initiative* (6)

In a living for persons with cognitive disabilities, they had pictures of the personnel working there. The pictures were placed on different boards depending on if they worked the day, were going to work the night or were on vacation. One morning one person got up earlier than usual and moved a picture of a personnel to the vacation board, since he didn't like that person in a schedule.

*History* (4)

A young man with autism in Denmark had only 2 persons whom he had known his whole life, his stepmother and stepfather. The stepmother came to his activity center and told the personnel that she had got cancer, and only had 3 more months to live. To help the young man to keep his history a CD with pictures of all the big moments in his life were made together with the stepmothers voice telling what happened. Now when the stepmother is dead he often sits with the CD, recalling what has happened.

The result of the reliability of the division into categories were that 88% (21 of 25) of the postings were in the same category for all judges.

We received 140 answers from the e-mail survey, which means an answer rate of 54%. 77 of them used digital pictures for persons with disabilities. The most used categories

were: *planning* (68), *documentation* (65), *situation of choice* (65), and *sequence* (61). The other categories were used by nearly 50% of the users. See figure 3 for more details.
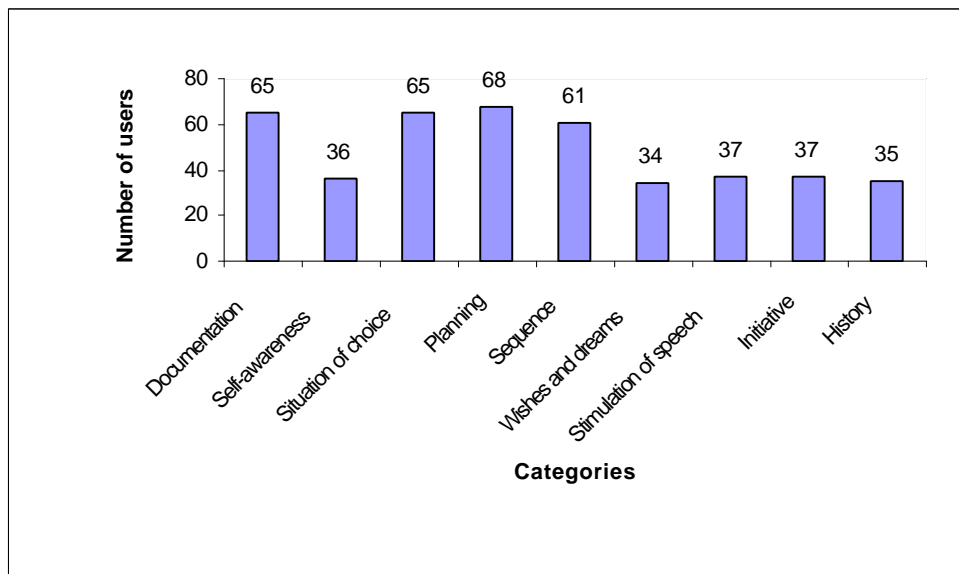


Figure 3. Results of the e-mail survey.

The result of the statistical analysis was that there was a significant difference between the discussion and what was done ($\chi^2$ (8)=97,9, p<0.05). The answers in the e-mail survey were also analyzed to see if they differentiated from random answers with the $\chi^2$-test "goodness of fit". There was a significant difference and the categories that made a significant contribution to that were "documentation", "situation of choice", "planning" and "whishes and dreams" ($\chi^2$ (8)=38,9, p<0.05).


## 4. DISCUSSION

Identity and Power are two concepts that give a good summary of the experiences of many people who have used digital camera and personal pictures as cognitive tools.

The identity has been strengthened through a great amount of pictures of the person in different activities and social situations. When a person afterwards wants to use the photographs to recall a special episode or environment, it is important that the person can recognize himself in the pictures.

If you want to understand who you are you must have knowledge about your experiences as a child and a youngster. Some of the users have spent their childhood in different institutions and they have been eager to go back and take pictures of buildings and environments as a way to reconstruct and to control important phases of their personal history. These pictures have made it possible for them to talk to relatives and friends about what really happened that time and also why.

That the users have got more power and influence through pictures has been confirmed through an increased ability to take the first step in different social situations. Persons with difficulties to express themselves verbally have used personal pictures to initiate conversations about absent people, artifacts and phenomenon, which was impossible for them earlier.

The pictures also have made it possible for the users to choose between different alternative actions and make decisions about issues that were important for them. The possibility to use pictures to make plans has for many of the users meant an increased influence.

Students with autism have since they started using pictures called for more precision in the schedules and plans which their teachers present for them. Through this increased precision they have got an opportunity to control if the teachers hold what they promised.

Since this field is relatively new we have tried to disseminate experiences and ideas through different channels of which the most important is the above described discussion forum about pictures. The forum has shown to be a very effective way to spread knowledge about the use of pictures. Both relatives and professionals take part in the discussions and share their personal experiences with others and give advices to those who just have started. We think that the discussion forum has been an excellent source for our research and a way to make contacts with engaged parents and professionals who are eager to develop different aspects of the picture concept.

## 5. FUTURE WORK

Our findings show that this new and growing research area needs more research. To follow up this study we are planning to do a larger survey with open questions concerning not only the use of the pictures, but also other issues like what pictures are taken of and which cameras that are used.

## REFERENCES

1. Andersson, G. (1997). Min dagbok med digitala bilder ("My diary with digital pictures" my translation). Certec, Lund University, Sweden. http://www.certec.lth.se/ord/dagbok.html.
2. Andersson, G. (1998). Ord som kommer tillbaka men också en del nya ord ("Words that come back, but also some new words" my translation). Certec, Lund University, Sweden. http://www.certec.lth.se/ord/nya_ord.html.
3. Andersson, G. (1999). Det tar aldrig slut ("It never ends" my translation). Certec, Lund University, Sweden. http://www.certec.lth.se/dok/dettaraldrigslut/.
4. Andersson, K. (2000). Att inte kunna tala är inte detsamma som att inte ha något att säga - Alternativ Kommunikation med Digitala Personnära Fotografier för Personer med Kognitiva Funktionshinder ("Not being able to talk don't mean that you don't have anything to say" my translation). Department of Human Work Science, Blekinge Institute of Technology, Sweden. http://www.certec.lth.se/dok/attinte/
5. Brown, B.A.T., Sellen, A.J, O'Hara K.P. (2000). A Diary Study of Information Capture in Working Life, *Proceedings of CHI 2000 Conference Proceedings* (The Hague, Netherlands April 1-6 2000), ACM Press, 438-445.
6. Danielsson, H. (1997). Bildligt talat (Figuratively speaking). Certec, Lund University, Sweden. http://www.certec.lth.se/dok/bildligttalat/.
7. Discussion forum on digital pictures (only in Swedish). http://www.certec.lth.se/bilder/
8. Jönsson, B., Philipson, L., Svensk, A. (1998). What Isaac thoughttaught us. Certec, Lund University, Sweden. http://www.certec.lth.se/doc/whatIsaac/.
9. Jönsson, B., Svensk, A. (1995). Isaac – A Personal Digital Assistant for the Differently Abled. *Proceedings of the 2nd TIDE Congress* (Paris, France, April 1995), pp 356-361.
10. Mandre, E. (1999). Från observation till specialpedagogisk design (Designing special education). Certec, Lund University, Sweden. http://www.certec.lth.se/dok/franobservation/
11. Mayer-Johnson PCS symbols, Widgit software ltd http://www.widgit.com/s_pcs.htm
12. Mirenda, P., Locke, P. (1989). A Comparison of Symbol Transparency in Nonspeaking Persons with Intellectual Disabilities. *Journal of Speech and Hearing Disorders*, Volume 54, 131-140.
13. O'Reilly & Associates, Inc. WebBoard. http://www.oreilly.com/catalog/wboard4/
14. Sporre, M. (2000). Digitala bilders kommunikativa funktion för människor med kommunikationshandikapp ("The communicative function of digital pictures for persons with communication disabilities" my translation). Department of Logopedics, phoniatrics and audiology, Lund University, Sweden.
15. Stenkilsson, G., Alfonsson, T. (2000). Let's go Photoshopping - Att göra det abstrakta konkret möjliggör för personer med begåvningshandikapp att delta i designutveckling. ("Let's go Photoshopping – To make the abstract concrete, makes it possible to take part in the design process for persons with cognitive disabilities" my translation). Department of Human Work Science, Blekinge Institute of Technology, Sweden. http://www.certec.lth.se/dok/attinte