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10 Play for children with disabilities: some reflections on the results on the users' needs and on the role of technologies

10.1 Short summary of the Section n. 2

This chapter concludes the results of the report on users' needs from LUDI Working Group 4. The effort in WG4 was on investigating the users' needs as a necessary base for the development methods, tools and frameworks for play for children with disabilities.

The main aim of this report was to investigate if children with disabilities have access to and participate in the broad range of play activities. The aim was also to investigate their needs according to parents and members of disabilities associations in different societal contexts. To collect the users' answers several questionnaires were developed and distributed in more than thirty countries. The previous chapters in section 1 present the surveys and the analysis of answers from parents and members of disability associations. The section 2 presents 3 case studies at the national level (Finland, Lithuania and Sweden) of users' needs based on literature reviews of reports and research, which give also indication of the needs that are emerging in various contexts, depending on specific policies and provisions.

From the results of the surveys, we can state that children with disabilities would like to play with other children, but they rather risk to be lonely; teachers are not competent enough to support and create good setting for playing especially in mainstream schools. Many children with disabilities want to play freely with friends and their family members, but they have often to deal with barriers and shortcomings. Some parents feel that they have to prioritize training. The needs may be different for children with different disabilities and some children are reported to be involved in various play activities. There are however large needs of adaptations in many activities. Most of the playgrounds are still not accessible for children with special needs.

10.2 New technologies

As the importance of play for children was grounded in the Garvey's thought (1990, p. 4), the play was classified within LUDI along two dimensions: cognitive and social dimensions.

The available technological tools and devices, when usable and accessible, may support the development of children's skills when they practice any type of play.

Play is one of the most important activities in childhood, at the same time, play is one of the most important devices for child to learn.

In early childhood, children use to play to construct social relations for the common play experience. While playing, and growing during playing, children develop their language skills and other motor and social skills.

This development process is sensitive to the used play tools and technical devices.

Nowadays – in our digital age – children during the play activities might get into contact with IT tools at a very early stage. Teachers, educators, kindergarten teachers and IT developers have recognized this, and all over the world a lot of hardware and software products were developed for children. In this section the authors would like to give a short review about the state of the art related to this aspect.

Pretend and role playing games are very popular kind of computer games. The relationship between pretend play, social competences and involvement in school-based activities in children aged 5-7 years was investigated by Uren and Stagnitti in 2008 (Uren et al., 2008). They found a significant relationship between elaborate pretend play and object substitution scores, involvement scores and peer play interaction scores. The conclusion was that social competence and involvement skills are related to a child's ability to engage in pretend play.

The Internet and video games changed the way in which children play. The younger children love to dress up their favourite characters from tales, the older children prefer role-playing games. One of these very popular games is "Dressing up" type games, and uses some augmented reality tools (Microsoft, 2016).

Children's play focus changes around the age of 10-12 years. From traditional desktop games their focus turns to mobile platforms and games. The Commonsensemedia.org site collected the most popular games for this age group (Commonsensemedia, 2016). In this collection about fifty games can be found. Some of them are typical entertainment games (e.g. Adventures of Poco Eco and Lost Sound game, which gives a meditative musical journey through a lush neon wonderland). The Kuddle is a photo-sharing app and gives a good intro to the social media.

The Marble Math with marble mazes proposes math practice for fun, Dragon Box Element is an innovative geometry app that integrates learning with play. The DIY App is a creative community app for children, kids learn, share and build skills on excellent social app. The Box Island introduces the logic of computer science with a cute coding adventures. Questimate is a dynamic estimation game and lets children design their own questions. DK The Human Body App's gorgeous reference shows the wonders of human anatomy.

The Slice it! is a tough but really funny geometry puzzle game for brainy players. Playing with Duolingo app gives opportunity to learn languages for free with plentiful, fun, free lessons.

Children over 14 may play with a lot of robust desktop games. The most popular console games are designed to PlayStation, Xbox console with Kinect sensor and Nintendo Wii. With respect to these products, the following question arises: when is it good for children to start playing video games? This question is a controversial subject and researchers start to explore the effects of screened entertainment media on young children, but they did not explore the relation between the starting time of playing with videogames between any other factors. A lot of studies published in the last decade found that children under the age of three should not be exposed to any form of screen entertainment (TheGuardian.com, 2014), because there have also been links to the later development of ADHD. After the age of three the videogames can help children with numeracy and literacy. For older children there are plenty of games with creative and educational value.

The most obvious example is the building simulator, Minecraft. Minecraft is able to teach everything while playing from architecture to physics, geology, and electronics. The developer company of the Minecraft is TeacherGaming (Teachergaming, 2016). They released a special edition from Minecraft, the MinecraftEdu, designed for classroom use. MinecraftEdu allows teachers to set up and manage several kinds of teaching and learning projects.

The other popular videogame is SimCity that can teach strategic thinking as well as providing information on history, geography and urban planning.

There are also excellent sims like Orbiter that teach children the basics about the aeronautics. Most of videogames can help with hand-eye coordination, develop fine motoric skills, logical thinking, and teamwork for young.

Another project deals with the problem of developing serious games for children with mild and moderate learning difficulties. Called, Intelligent Serious Games for Social and Cognitive Competence" (ISG4C.eu, 2016). By using the suite of serious games for desktop and mobile usage, students with learning difficulties will increase their skills and competences in achieving goals, managing their behaviour in a social context, anticipating the consequences of their behaviour for self and others, generating creative solutions, building a positive sense of self-efficacy, managing their time and resource to prepare for the school activities, improve cooperation with peers and teachers/trainers, coping with difficulties and managing social interactions. An important goal of the curriculum is to enable persons with learning difficulties to learn and understand how to improve their social and cognitive competences and to develop an appreciation of the value and practice of the lifelong learning.

10.3 Developing games based on users' needs

In this section the topic of digital games and the design of user interface in digital games from the viewpoint of special needs users is developed. In spite of the fact that 10% of the population worldwide has some disabilities, most software engineering

companies do not develop yet products for special users, probably because they do not recognize the potential in a market that is considered limited.

This section provides a list of minimal requirements that every software engineer, computer scientist and WEB designer should take into account if they develop a new software or a new WEB site with gamification elements (Sik-Lanyi, 2008).

Visual Impaired and Partially Sighted Persons

It is important to keep on the developer's mind that the visual impairment and partially sighted people have no perfect vision. The visus of perfect vision is 1. A partially sighted person's visus is between 0.1 and 0.3.

- Ensure that all information can be accessed via text or sound, such that blind users can use screen readers or Braille display to access the information;
- Give pre-recorded audio as an alternative mean;
- Allow users to navigate the site by using keyboard (the mouse is hardly used by blind users);
- Minimize the users' memory load because blind users can only hear one word at a time and need memory to integrate parts of the heard information (Hung, 2001).
- For partially Sighted Persons
- Ensure the text size is large enough otherwise low vision users usually need screen magnifier to enlarge the text.
- Give audio option to notify low vision users about new information.
- Minimize the users' memory load because the effective screen size is very small while using screen magnifier.
- For users with low vision pictures must be drawn with thick contour lines. The user can be given the option to modify the contour line thickness of the objects. The user must be able to vary the colour of the objects and background and the speed of motion and to stop the animation (Sik Lányi, 2005).

10.3.1 Colour Deficient (colour blind) persons

Colour blindness is mostly neglected; even most of the people do not consider this as a serious problem. It is quite common to see combinations of background and foreground colours that make pages virtually unreadable for colour blind users. Background, text, and graphics colours should be carefully chosen to allow for persons with colour blindness. Designing for colour blind people is complicated. It's not a matter of green/red or yellow/blue combinations.

The most important issue in designing for colour blind users is not to rely on colour alone to convey information and not to use colour as a primary means to impart information (Karagol-Ayan, 2001).

If we have no possibility to test our software by the help of colour blind people, we have to see it in greyscale setting at least to check whether all the information is visible or not.

Deaf and hearing impaired persons

Persons with impaired hearing may have a limited vocabulary. This is one of the problems with hearing impaired persons. Therefore new information and instructions have to use simple language alongside cartoon-like presentation. They still require sounds to accompany the graphics. This also applies to anyone with any cognitive impairment.

- Give visual information (text and/or picture) that is redundant with audible information;
- Allow for the users to configure frequency and volume of audible cues.
- Do not design interactions to depend upon the assumption that a user will hear audio information.

For deaf and hard of hearing persons to have access to multimedia applications, ways need to be developed to support the presentation of complex sounds and closed captioning for speech (Sik Lányi, 2006).

Physically Disabled Persons

The biggest problem for persons with impaired fine motor ability is using the input devices.

- Do not design the navigation and input only using it by mouse, because the users might have poor motor ability;
- Do not design the navigation, input and commands using it by voice input devices because of the control problem of face muscles;
- Do not develop the navigation using multiple keys simultaneously.

The multimedia software must be accessible via the keyboard, therefore it has to have an easy use and good keyboard navigation system. Thus the task is to find the optimal navigation method for the mobility impaired user. If the user does not have a special input device, navigation can be facilitated with a moving rectangle the speed of which is adjustable or to use voice controlled navigation or command system (Sik Lányi, 2006).

Intellectual disability

There is a wide variation of cognitive impairments that could be categorized as Memory, Perception, Problem-solving, and Conceptualizing disabilities. Memory disabilities include difficulty obtaining, recognizing, and retrieving information from short-term storage, as well as long-term and remote memory.

It is necessary to design multimedia software or WEB pages in ways that minimize the skills and abilities required to navigate them. Auditory output might seem confusing these users, or be difficult for them to understand. The designers need to define terms that may not be known to the cognitive disabled persons.

- Minimize the cognitive load while navigating in the software

- Use graphics for navigation whenever possible
- Avoid animated graphics and the use of overlay large file sizes. Use animations and dynamic display with care.

To sum up design principles (ISO 92411-11, 1998; Sik-Lanyi, 2012)
- Ensure presentation at appropriate speed
- Allow users to go back
- Allow User Control
- Make any text plain text
- Never convey information by colour alone
- Ensure sufficient contrast
- Help users navigate
- Make clear Maintain organization
- Use unique and informative text descriptions for any hyperlinks
- Use accessibility features
- Design simply in simple layouts
- Use fallbacks
- Make systems consistent and error free
- Aim for compatibility with assistive technologies
- Allow keyboard access
- Do not include elements that are known to cause seizures

10.4 Conclusion

To sum up, children with disabilities must have access to play as other children do, but the results of this report show that they may lack the possibilities to participate in play. Thanks to new technologies and extra effort to support play for children the developers may be able to create new software for these children to help them close up to other children. The support of friends, family and trainers is however inevitable.

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