ENABLING PLAY

DESIGNING ACCESSIBLE PLAYGROUND EQUIPMENT FOR AND WITH CHILDREN

Enabling play – Designing accessible playground equipment for and with children

Master thesis
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Pictures from workshops taken with the permission of the children's parents and can only be used in the context of this thesis.
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"GOOD DESIGN ENABLES, BAD DESIGN DISABLES" PAUL HOGAN

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ABSTRACT

THIS THESIS EXAMINES the concepts of accessibility and ability-based design in a playground context and takes a participatory approach to product development. The research focuses on finding out the needs and experiences of physically disabled children, and involving them in the design process of playground equipment. The purpose of this thesis is to find out how consultation and co-design with physically disabled children can assist the development of accessible and inclusive playground equipment and to examine what kind of a role disabled children can have in identifying customer needs which in turn could lead to better and more versatile products for the majority of children as well.

This thesis provides a review of relevant literature concentrating on the key areas of play, research on the accessibility of play spaces, prominent inclusive design approaches, participatory design, and lead user theory. It aims to find answers to the following questions: How to design an accessible playground together with children? What is an accessible and playable piece of playground equipment like? Can physically disabled children have a key role in identifying latent customer needs? And will designing for their needs result in better design for all? It also aims to find solutions on how to promote and support ability. The goal of this thesis is to report the process and benefits of involving special needs children in the design process of accessible playground equipment and to develop an accessible playground equipment concept based on the insights found during the process.

The findings of this thesis indicate that there is no need for specialized playground equipment intended for disabled children. Instead there is a need for playground equipment that is useable and playable by children of any age and ability, equipment that

gives the opportunity to develop skills independently and supports each child to reach their full potential. The parents of able-bodied children can also have restricted mobility or eyesight and can face difficulties in operating in existing playgrounds. All of the users of playgrounds can suffer from situational disability and benefit from equipment designed to support different levels of ability.

Physically disabled children can be seen as having a major role in this product development process. Designing for their needs and abilities resulted in finding novel perspectives on how to design playground equipment. The needs of extraordinary users, physically disabled users in this case, can be considered the same as the needs ordinary users face situationally. Taking a top down approach to design and designing for physically disabled children resulted in a product concept that serves a wider range of users with different abilities. Thus designers should move away from designing for disabled or able-bodied and focus on designing for a range of abilities instead. Focusing on abilities enables designing solutions that support different levels of ability and do not require adaptation, leading to more mainstream products for a wider market. Products accepted by the mainstream market cannot be seen as stigmatizing. Both physically disabled children and able-bodied children tested the playground equipment concept in evaluation workshops. All of the children were excited about the concept regardless of their abilities and felt that it was designed for them.

CONTENT

1 INTRODUCTION

UNIVERSAL DESIGN AND accessibility are the starting points of my Master's thesis because for me design is about creating a better and more equal environment for everyone. Accessibility is rarely the basis for new product development and is considered to be an additional cost, which leads to products and environments that exclude users and prevent them from participating. This is the case with the majority of playgrounds in Finland as well as internationally. While spending time with my two-year-old daughter in different playgrounds I have come to realize that there are little or no possibilities for children with restricted mobility to participate in play in existing playgrounds. I am interested in studying playgrounds and play equipment and developing future playground concepts from an accessible point of view. I believe that good design is everyone's right as well as the right for play and fun. I want to study whether designing for children with physical disabilities will result in better design for all. I also want to include the end users of playgrounds – the children in the design process.

This thesis aims to find answers to the following questions: How to design an accessible playground together with children? What is an accessible and playable piece of playground equipment like? Can physically disabled children have a key role in identifying latent customer needs? And will designing for their needs result in better design for all? It also aims to find solutions on how to promote and support ability. Children are involved in the design process of playground equipment, through co-design workshops. This thesis aims to result in a accessible playground equipment concept developed through comprehensive research. The research focuses on physical disabilities, children with restricted mobility or eyesight. The term physically disabled children is used to refer

to children who use mobility aids such as forearm crutches, canes, walkers and wheelchairs or who are visually impaired. Deaf children are left out of the study because by consulting a deaf parent through The Finnish Association of the Deaf it became clear that visually pleasing equipment and good eye contact are the most important factors in playground equipment and deaf children are able to function in existing playgrounds. The term child is used to cover the whole age range from birth to 13-year-old children. The children participating in the co-design workshops are from six to thirteen years old.

The research focuses on the physical aspects of the accessibility of playgrounds as well as the social aspect of inclusivity in playgrounds. The thesis provides a review of relevant literature that concentrates on the key areas of play, research on accessible play spaces, main inclusive design approaches, participatory design and lead user theory. The aim is to show through design research practice how consultation and co-design with disabled children assists the development of accessible and inclusive play space. The disabled children's experiences of playgrounds are the reference point for the product development. Disabled children are considered as valued members of society and recognized as empowered individuals.

My hypothesis is that there is no need for special playground equipment intended for disabled children. Instead there is a need for playground equipment that is useable and accessible for children of any age and ability, equipment that gives the opportunity to develop skills and abilities and supports each child to reach their full potential. Designing play spaces to meet the needs and abilities of children with physical disabilities will result in better play spaces for all and will bring social, educational and functional benefits and increase the play experience of playground equipment.

The methods used are participatory design, co-design workshops with children, expert interviews, questionnaires for the parents of disabled children and utilizing a blog for gathering inspiration and best practices in the background research phase.

2 LITERATURE

2.1 INTRODUCTION TO INCLUSIVE DESIGN APPROACHES

2.1.1 UNIVERSAL DESIGN

INCLUSIVE DESIGN APPROACHES have been developed to complement traditional usability approaches and they can be considered as derivations of 'user-centered design'. The approaches are referred to as 'design for all' (Europe), 'universal design' (USA and Japan) and 'inclusive design' (UK) (Keates and Clarkson, 2003). The terms hold slightly differing historical and cultural meanings. Universal design was first used by Mace in 1985 to communicate a design approach that could be utilized by a wider range of users. The initial term used around the world was barrier-free design. It related to efforts that began in the late 1950s to remove barriers for "disabled people" from the built environment. The phrase "reduce the barriers to the disabled" was later replaced with the term accessibility, which focuses on issues of mobility, such as wheelchair access. The distinction of terminology is blurred, and the terms used at present illustrate the shift in design thinking – from a lack of awareness of how design can be restrictive, to an awareness and removal of environmental barriers, and beyond that to a concept of designing for as many users as possible. (Ostroff, 2001)

The founder of Center for Universal Design, architect Ron Mace defined universal design as "the design of products, environments, programs and services to be usable by all people, to the greatest extent possible, without the need for adaptation or

specialized design." Universal design focuses on the interrelationship between the physical environment and the user (Ostroff, 2001). Universal design is a worldwide movement that calls for designed environments that are equitable, flexible, intuitive, perceptible, safe, easy, and accommodating. Universal design comes from incorporating these guiding principles into design thinking. It is a framework for creating solutions. Universal design requests designers to rethink fundamental formal solutions and concepts and to reflect on environmental equity for all sorts of users as well as to consider multiple ways in which the environment can be designed and adapted to suit people's varying needs such as those of the aging or of people not speaking the dominant language. (Knecht, 2004)

The seven principles of universal design, developed in 1997 by the Center for Universal Design, present a process by which to define, guide and evaluate the usability of design elements. The principles offer guidance to better integrate features that meet the needs of the widest range of users. (The Center for Universal Design, 1997)

FIGURE 1
THE SEVEN PRINCIPLES OF UNIVERSAL DESIGN (THE CENTER FOR UNIVERSAL DESIGN, 1997)

THE SEVEN PRINCIPLES OF UNIVERSAL DESIGN

PRINCIPLE ONE: EQUITABLE USE
THE DESIGN IS USEFUL AND MARKETABLE TO PEOPLE WITH DIVERSE ABILITIES.

GUIDELINES: 1A. PROVIDE THE SAME MEANS OF USE FOR ALL USERS: IDENTICAL WHENEVER POSSIBLE; EQUIVALENT WHEN NOT. 1B. AVOID SEGREGATING OR STIGMATIZING ANY USERS. 1C. PROVISIONS FOR PRIVACY, SECURITY, AND SAFETY SHOULD BE EQUALLY AVAILABLE TO ALL USERS. 1D. MAKE THE DESIGN APPEALING TO ALL USERS.

PRINCIPLE TWO: FLEXIBILITY IN USE
THE DESIGN ACCOMMODATES A WIDE RANGE OF INDIVIDUAL PREFERENCES AND ABILITIES.

GUIDELINES: 2A. PROVIDE CHOICE IN METHODS OF USE. 2B. ACCOMMODATE RIGHT- OR LEFT-HANDED ACCESS AND USE. 2C. FACILITATE THE USER'S ACCURACY AND PRECISION. 2D. PROVIDE ADAPTABILITY TO THE USER'S PACE.

PRINCIPLE THREE: SIMPLE AND INTUITIVE USE
USE OF THE DESIGN IS EASY TO UNDERSTAND, REGARDLESS OF THE USER'S EXPERIENCE, KNOWLEDGE, LANGUAGE SKILLS, OR CURRENT CONCENTRATION LEVEL.

GUIDELINES: 3A. ELIMINATE UNNECESSARY COMPLEXITY. 3B. BE CONSISTENT WITH USER EXPECTATIONS AND INTUITION. 3C. ACCOMMODATE A WIDE RANGE OF LITERACY AND LANGUAGE SKILLS. 3D. ARRANGE INFORMATION CONSISTENT WITH ITS IMPORTANCE. 3E. PROVIDE EFFECTIVE PROMPTING AND FEEDBACK DURING AND AFTER TASK COMPLETION.

PRINCIPLE FOUR: PERCEPTIBLE INFORMATION
THE DESIGN COMMUNICATES NECESSARY INFORMATION EFFECTIVELY TO THE USER, REGARDLESS OF AMBIENT CONDITIONS OR THE USER'S SENSORY ABILITIES.

GUIDELINES: 4A. USE DIFFERENT MODES (PICTORIAL, VERBAL, TACTILE) FOR REDUNDANT PRESENTATION OF ESSENTIAL INFORMATION. 4B. PROVIDE ADEQUATE CONTRAST BETWEEN ESSENTIAL INFORMATION AND ITS SURROUNDINGS.
4C. MAXIMIZE "LEGIBILITY" OF ESSENTIAL INFORMATION. 4D. DIFFERENTIATE ELEMENTS IN WAYS THAT CAN BE DESCRIBED (I.E., MAKE IT EASY TO GIVE INSTRUCTIONS OR DIRECTIONS). 4E. PROVIDE COMPATIBILITY WITH A VARIETY OF TECHNIQUES OR DEVICES USED BY PEOPLE WITH SENSORY LIMITATIONS.

PRINCIPLE FIVE: TOLERANCE FOR ERROR
THE DESIGN MINIMIZES HAZARDS AND THE ADVERSE CONSEQUENCES OF ACCIDENTAL OR UNINTENDED ACTIONS.

GUIDELINES: 5A. ARRANGE ELEMENTS TO MINIMIZE HAZARDS AND ERRORS: MOST USED ELEMENTS, MOST ACCESSIBLE; HAZARDOUS ELEMENTS ELIMINATED, ISOLATED, OR SHIELDED. 5B. PROVIDE WARNINGS OF HAZARDS AND ERRORS. 5C. PROVIDE FAIL SAFE FEATURES. 5D. DISCOURAGE UNCONSCIOUS ACTION IN TASKS THAT REQUIRE VIGILANCE.

PRINCIPLE SIX: LOW PHYSICAL EFFORT
THE DESIGN CAN BE USED EFFICIENTLY AND COMFORTABLY AND WITH A MINIMUM OF FATIGUE.

GUIDELINES: 6A. ALLOW USER TO MAINTAIN A NEUTRAL BODY POSITION. 6B. USE REASONABLE OPERATING FORCES. 6C. MINIMIZE REPETITIVE ACTIONS. 6D. MINIMIZE SUSTAINED PHYSICAL EFFORT.

PRINCIPLE SEVEN: SIZE AND SPACE FOR APPROACH AND USE
APPROPRIATE SIZE AND SPACE IS PROVIDED FOR APPROACH, REACH, MANIPULATION, AND USE REGARDLESS OF USER'S BODY SIZE, POSTURE, OR MOBILITY.

GUIDELINES: 7A. PROVIDE A CLEAR LINE OF SIGHT TO IMPORTANT ELEMENTS FOR ANY SEATED OR STANDING USER. 7B. MAKE REACH TO ALL COMPONENTS COMFORTABLE FOR ANY SEATED OR STANDING USER. 7C. ACCOMMODATE VARIATIONS IN HAND AND GRIP SIZE. 7D. PROVIDE ADEQUATE SPACE FOR THE USE OF ASSISTIVE DEVICES OR PERSONAL ASSISTANCE.

2.1.2 DESIGN FOR ALL

THERE IS NO single clear definition of the goal of design for all. It is a philosophy that encourages designers to consider the needs of the wider range of users and typically results in products designed for the largest possible population, but not the entire population. Some users will most likely be unable to use the final product, but design for all allows for the design of additional products to meet their needs. (Keates and Clarkson, 2003)

Harper (2007) argues that because every person is a unique individual the concept of designing for the widest range of people is not achievable. Creating universal usability by designing for all involves making generalizations about users and these generalizations have led to many users being excluded in the first place. According to Harper there are no universally usable products, because there is too wide a range of human abilities and too great a range of situations that an individual may encounter. Universal usability is more a function of keeping all people and all situations in mind and trying to create a product that is as flexible as commercially is practical and can accommodate different users and situations. Harper suggests that universal usability is possible but not by following the design for all approach – it is only possible by "design for one".

2.1.3 ACCESSIBILITY

ACCESSIBILITY DESCRIBES A site or building that complies with the minimum accessibility standards set by local building code or legislation. Accessible design aims at meeting the environmental and communicational needs of the functional limitations of people with disabilities. Accessible design can be seen as an aim to fulfill minimum requirements to achieve usability. (Skulski, 2007)

Whereas universal design is a movement, accessibility is a mandate. For instance the U.S. law requires public places to provide physical accessibility to people with disabilities. The accessibility laws can be seen as confined, since they focus on people with a narrow range of certain disabilities, such as wheelchair users or people with visual or hearing impairments. Accessibility guidelines articulate the standards that meet the physical requirements of the

laws. The laws ensure access to specific types of buildings based on presumptions about certain barriers in the environment, for example they require a one level entry into public buildings for wheel-chair users and audio and braille signs in the elevator for blind users. Building accessible environments often means adding some special accessible features. The stereotype of accessibility is that it creates places that are segregating, costly and ugly. (Knecht, 2004)

2.1.4 INCLUSIVE DESIGN

INCLUSIVE DESIGN FOCUSES on factors that cause "design exclusion". The term design exclusion focuses attention to those excluded by particular designs of products, services or environments. Inclusive design should aim to eliminate exclusion that arises from 'poor' (non-inclusive) design practices. The key point is that some people will always be excluded by any specific design, and that design decisions should only be taken with due consideration of the impact on the users. (Keates and Clarkson, 2003)

2.1.5 ABILITY BASED DESIGN

ABILITY-BASED DESIGN IS about focusing on ability throughout the design process and supporting the full range of human potential. Ability-based design attempts to shift the focus of accessible design from disability to ability, making ability its central focus. Abilities vary, from those of professional athletes to toddlers and the elderly. Ability is not static; it is influenced by the context in which it is exercised. Context can temporarily decrease a user's abilities in similar ways as the effects of personal health-related impairments. Situational impairments arise when aspects of a user's environment harm his or her ability to perform specific activities. Contextual factors impacting abilities are ambient noise, distraction, divided attention, body motion, walking vibration, weather (e.g. rain, cold temperature), restrictive clothing (e.g. gloves causing "fat fingers"), uneven terrain, glare, dim light or darkness, tight or crowded spaces among others. Designs that benefit disabled people may also benefit nondisabled people who experience temporary situational impairments. Ability based design focuses on what users can do and in what contexts they can do it. (Wobbrock, et al., 2011)

ABILITY-BASED DESIGN PRINCIPLES

1. ABILITY.
-DESIGNERS WILL FOCUS ON ABILITY NOT DIS-ABILITY, STRIVING TO LEVERAGE ALL THAT USERS CAN DO.

2. ACCOUNTABILITY.
-DESIGNERS WILL RESPOND TO POOR PERFORMANCE BY CHANGING SYSTEMS, NOT USERS, LEAVING USERS AS THEY ARE.

3. ADAPTATION.
-INTERFACES MAY BE SELF-ADAPTIVE OR USER-ADAPTABLE TO PROVIDE THE BEST POSSIBLE MATCH TO USERS' ABILITIES.

FIGURE 2
ABILITY-BASED DESIGN PRINCIPLES
(WOBBROCK ET AL.,2011)

2.1.6 ABILITY BASED DESIGN AS THE FRAMEWORK OF THE THESIS

THERE ARE SEVERAL approaches to designing more accessible and inclusive products. Instead of focusing on fulfilling standard accessibility requirements they aim to create a more inclusive design process for everyone. However all of them have faults that prevent them from being useful in all circumstances. For example focusing solely on accessibility can lead to designing spaces that are segregating and do not support equitable use. Recognizing the power that environmental factors have to enable or disable a person is the key to tackling the right design challenges.

Whereas universal design and design for all asks the question 'what can everyone do?' ability-based design asks the question 'what can you do?'. The first question has turned out to be problematic (Harper, 2007) and a suggestion has been made to move from design-for-all to design-for-one. Ability-based design can be considered as a good starting point for achieving design-for-one. (Wobbrock, et al. 2011)

Playgrounds are generally public places that should offer all children the possibility to play. All of the users of playgrounds have varying abilities according to their age, interest and health. The

conditions in which playgrounds are used alternate very much due to changes in weather. Weather is a relevant factor that can cause situational disability to any child at a playground.

Ability based design can be considered as a good starting point when designing playgrounds because it does not divide children into able-bodied and disabled but focuses on what children can do and how to support that ability. It puts all children on the same line and aims at resulting in solutions that support the full range of human potential. I use ability-based design as the framework for this thesis and focus on ability throughout the design process.

2.2 IDENTIFYING WHOM TO INVOLVE IN THE DESIGN PROCESS

IN AN IDEAL situation when designing for inclusivity, the identified users represent the observed spread of capabilities in the population. Some users should have high functional capacity (low impairment), other users should have moderate functional capacity (moderate impairment) and there should also be users with low functional capacity (high impairment). The identification of representative users and securing access to them can be costly and time-consuming. Therefore an increasingly popular approach to inclusive design is to design for the more extreme end-users. The weakness of focusing on extreme users is that designers end up proposing solutions that can become sub-optimal for many other users. Designing for extreme users requires awareness of how those users map to the population at large. (Keates and Clarkson, 2003, p.53-54)

Determining who is an extreme user depends on the design challenge and which aspects of it will be explored to an extreme. Defining the facet to be explored helps to define the people who may be extreme in that viewpoint. Extreme users' needs are often amplified and their work-arounds more notable. Observing and interviewing them can serve as inspiration and uncover insights. The needs that are uncovered through extreme users are often the needs of a wider population. (Stanford University Institute of Design, 2010)

2.2.1 THE USER PYRAMID

THE REQUIREMENTS AND limitations of disabled users provide important information when new products are developed. The user pyramid (see Figure 1) illustrates this approach to the design process. The user pyramid represents the full range of potential users, their abilities in performing daily activities, and the way these are affected by age and disability. In the bottom of the pyramid are fully capable users together with users who have minor disabilities such as impaired hearing or sight. In the middle of the pyramid are people with reduced strength and mobility caused by illness and more severe age-related impairment. The group contains a lot of elderly people and most of the 10% of the population who can be classified as disabled. An environment designed with regard to their functional abilities could enable most of these people to perform daily activities independently or with minimum assistance. The top of the pyramid consists of severely disabled people who need help with many daily activities, such as people in wheelchairs. Benktzon (1993) argues that it is important to include these people in the design process, since the higher in the pyramid the demands on the products are set the greater the number of end-users who can benefit from the products. Expanding the concept of the average and addressing user needs further up the pyramid results in a design outcome that better suits the majority of people. (Benktzon, 1993)

FIGURE 3
THE USER PYRAMID. A MAP OF DISABILITY ACROSS THE POPULATION. (BENKTZON, 1993)

SEVERELY
DISABLED PEOPLE

PEOPLE WITH REDUCED STRENGHT
AND MOBILITY

ABLE-BODIED PEOPLE AND THOSE
WITH MINOR DISABILITIES

2.2.2 LEAD USERS

SUCCESSFUL PRODUCT DEVELOPMENT requires accurate knowledge about user needs. According to von Hippel (1986) most potential users do not have the needed experience to problem solve and provide accurate data for marketing research regarding novel products or product categories characterized by rapid change. Overall users capacity to imagine novel products is limited and they are unlikely to generate new product concepts which conflict with the familiar. Their insights into new product needs and potential solutions are constrained by their own real-world experience. Because the world moves so rapidly especially in high technology industries the related real-world experience of ordinary users often becomes obsolete by the time a product is developed. Von Hippel proposes that user need research should focus on lead users, who are familiar with conditions which lie in the future for most and are in a position to provide accurate data on needs related to such future conditions. (von Hippel, 1986)

Lead users are defined as members of a user population having two characteristics. Lead users face needs that will be general in a marketplace months or years before the bulk of that marketplace encounters them and lead users are positioned to benefit significantly by obtaining a solution to those needs – and so may innovate. These characteristics indicate that lead users would be best positioned to understand what will be needed later by many, for their present-day reality represents aspects of the future from the perspective of those with mainstream needs. To identify lead users in a certain product category of interest, one must identify the underlying trend on which these users have a leading position. Possible lead users can be mapped with respect to only a few attributes—or even a single attribute, defined as narrowly as is wanted. Even though lead users can offer valuable insights regarding their needs, identifying lead users is difficult.

Lead users can be incorporated into user research through a four-step process:
(1) Identify an important market or technical trend
(2) Identify lead users who lead that trend in terms of (a) experience and (b) intensity of need
(3) Analyze lead user need data

(4) Project lead user data onto the general market of interest.
(von Hippel, 1986)

2.2.3 SITUATIONAL LEAD USER

HANNUKAINEN AND HÖLTTÄ-OTTO (2006) studied the identification of lead users, specifically, if so called "extraordinary" users could be used as lead users. Extraordinary users experience needs more frequently and in a larger scale than "ordinary" users – world ski champion vs. casual skier for example. The study compared the user needs of disabled (deaf and blind users) and "situationally disabled" (ordinary) users. The study on mobile phones focused on finding out if the needs of extraordinary users, disabled users in this case, are the same as those that ordinary users face situationally, and investigating if the extraordinary users also experience today what the target market may experience later and so are lead users.

"Situational disability" can be defined as a momentary disability that all people suffer from in many ordinary circumstances. When there is no light, we cannot use our eyesight, or when there is a lot of noise, we are not able to hear, for example. Hannukainen and Hölttä-Otto (2006) argue that if a product is based on the user needs of the majority of consumers that have no disabilities, everyday situations, where the use of eyesight, hearing or all limbs is limited, are left out. It is a significant advantage for a product to work well in all possible situations. The study showed that the needs that ordinary (situationally disabled) users face in special situations are similar to those of extraordinary (disabled) users in ordinary situations. Disabled persons experience needs that ordinary users may experience later, and in many cases they have already accomplished solutions to those needs. There are also examples of solutions the disabled users have found, which have later become general among ordinary users. Lead users or extraordinary users are many times considered high-performance users such as aerospace vs. car industry. The findings showed that also low-performance users, disabled persons in this case, can be seen as lead users and very beneficial in customer need identification.

Hannukainen and Hölttä-Otto (2006) recommend that extraordinary users should be included in customer need identification in product design. From time to time all users suffer from situations, when they are not able to use all their senses. Users

should not be divided into able-bodied and disabled, because ability level is not a dichotomy but a continuum. (Hannukainen and Hölttä-Otto, 2006)

2.2.4 PARTICIPATORY DESIGN

PARTICIPATORY DESIGN REFERS to the practice of collective creativity in design in general. Participatory design practices applied at the early front end of the design development process as well as throughout the design process can have a positive impact, with long-range consequences. Classically the user is a passive object of study and the designer is the interpreter of the user. In co-design, the user is given the position of 'expert of his/her experience' and plays a large role in idea generation and concept development. The designer supports the user in generating insights by providing tools for ideation and expression. Finally the designer gives form to the ideas. (Sanders and Stappers, 2008)

The role of the user in the design process depends on the level of expertise, passion and creativity of the user. All people are creative, but in different ways. Creativity seen in people's lives can be divided into four levels; doing, adapting, making and creating (see Table 1). Expertise, interest/passion, effort and returns grow with each level. The designer should facilitate people's expressions

TABLE 1 FOUR LEVELS OF CREATIVITY.
(SANDERS ET AL., 2008)

LEVEL	TYPE	MOTIVATED BY	PURPOSE	EXAMPLE
4	CREATING	INSPIRATION	'EXPRESS MY CREATIVITY'	DREAMING UP A NEW DISH
3	MAKING	ASSERTING MY ABILITY OR SKILL	'MAKE WITH MY OWN HANDS'	COOKING WITH A RECIPE
2	ADAPTING	APPROPRIATION	'MAKE THINGS MY OWN'	EMBELLESHING A READY-MADE MEAL
1	DOING	PRODUCTIVITY	'GETTING SOMETHING DONE'	ORGANIZING MY HERBS AND SPICES

of creativity at all levels, meaning leading, guiding and encouraging creativity. (Sanders et al. 2008)

The participation of disabled children and their families in planning and implementing an accessible play space as well as in evaluating and monitoring it is crucial to good practice. Parents and their children have first-hand insights on how access to equipment could be made easier (Dunn et al. 2004).

2.2.5 IMPLICATIONS ON THE DESIGN PROCESS

WHEN DESIGNING PRODUCTS to be used by all people to the greatest extent possible, the users should represent the actual spread of capabilities in the population. An alternative to trying to reach users representing the whole range of possible capabilities is to focus on identifying the needs of specific groups of users like extreme users, lead users or situational lead users. Identifying the highest functioning level possible, among the users situated at the top of the user pyramid, is a justifiable starting point that enables reaching a solution that will serve a broader range of users. It shifts focus from specific medical conditions to different levels of abilities which leads to designing more mainstream products rather than stigmatizing niche products, like aids.

Traditionally the needs of disabled people or children have not been focused on in consumer product design. As Hannukainen and Hölttä-Otto (2006) have pointed out, all people suffer from "situational disability" and it is a remarkable advantage for a product to work well in all possible situations that people face. Low-performance users such as disabled users can be seen as lead users who are very beneficial in identifying customer needs and conditions where "situational disability" can occur. It is also recommended that extraordinary users should be included in customer need identification in product design.

3 BACKGROUND OF PLAY SPACES

3.1 DISABILITY AND CHILDREN'S RIGHTS

ACCORDING TO WORLD Health Organization (WHO), in 2011 285 million people globally were visually impaired, of whom 246 million people had low vision and 39 million were blind. WHO estimates that in 2011 over a billion people, about 15% of the world's population, have some form of disability. Between 110 million and 190 million people have significant difficulties in functioning. The Global Burden of Disease (2004) estimates the number of children aged 0–14 years experiencing "moderate or severe disability" to be 93 million (5.1%) with 13 million (0.7%) children experiencing severe difficulties. In 2005 UNICEF estimated the number of children with disabilities under age 18 at 150 million. (Unicef, 2005)

The social definitions and concepts of disability have changed radically. The World Health Organization's classification system (WHO, 2002) has shifted from exclusively emphasizing the medical model, which views disability as a feature of the person, to the social model that highlights environmental factors in creating disability and sees disability resulting from an interaction of people with the environment. (Ostroff, 2001). Disability arises from the interaction of health conditions with contextual factors – environmental and personal factors. These factors can be either facilitators or barriers. Environmental factors include: products and technology; the natural and built environment; support and relationships; attitudes; and services, systems, and policies. (ICF, 2006)

The United Nations convention on the rights of a child (1959) state that play is a central part of children's life and every

child should have full opportunity for play and recreation and public authorities should aspire to promote the enjoyment of this right. The 23d article in the Convention on the rights of a child launched in 1989 reinforces the right stating that a child with disabilities shall be ensured access to recreational opportunities in a manner conducive to the child's achieving the fullest possible social integration and individual development. (United Nations, 1959. United Nations, 1989)

There are several laws and conventions (United Nations 1989; United Nations, 1993; ADA, 2000; Office of the Deputy Prime Minister, 2003; United Nations, 2006; Finland's constitutional law, 1999) that support the view that playgrounds should be accessible and usable for people with disabilities.

The universal design approach that aims at designing solutions to meet a diverse range of abilities is in line with the World Health Organization's (WHO) classification system which acknowledges that every human being can experience a decrement in health and thereby experience some degree of disability. WHO's system recognizes disability as a universal human experience and shifts the focus from the individual to the interaction of the individual in the environment. The classification system also takes into account the social aspects of disability and does not see disability only as a medical dysfunction. Examining disability as the interaction of the individual and the environment highlights the fact that the environment can either aggravate or minimize the experience of disability. (ICF, 2006)

3.2 PLAY AND PLAY SPACES

ALL CHILDREN SHARE the need and the right to play. Children interpret their world through play. Play includes a sense of pleasure and fun, which separates it from work. Play facilitates the learning of life skills like problem solving, independence, self-awareness, creativity, spatial knowledge and flexibility and ability to deal with change. Play provides a way for self-expression and social interaction as well as motivation for children to be active and engage with others. The physical, social, cognitive and emotional benefits of play are

as significant to able bodied children as they are to children with disabilities. (Kiss, 2007)

Children have an endless capacity for adventure and imagination and a fundamental need for exercise and social interaction. Play spaces are important social places for children and youngsters and also parents, care-takers, and the wider community. The places should enable children to enjoy spending time, be physically active, interact with their natural surroundings, feel safe to take risks and play alone and with others in multiple ways. (Shackell et al., 2008) Enabling disabled children to access play spaces helps them and their families build relationships and neighborhood networks that can promote social inclusion. (Dunn et al., 2004) In the playground as in life, the time spent together removes the stigma of difference and allows children the opportunity to develop friendships (Malkusak et al. 2002).

Many children with a disability suffer from isolation and loneliness and their lives are dominated by the experience of exclusion (Murray, 2002). Many of the experiences are the result of a poorly designed environment that highlights inability and impairment. A child can experience play spaces as places of disappointment and failure if none of the equipment is accessible to him or her (Dunn et al., 2004). Play deprivation can occur as a result of many different forms of barriers like the physical limitations of the child, environmental barriers and social barriers. Children that have physical limitations and are not given sufficient opportunities to engage in free play may acquire secondary disabilities, including diminished motivation and imagination, poorly developed social skills and increased dependence which affect their whole development. (Missiuna, 1991)

The most important feature of a play space is to offer all children access to the social experience of play (Dunn et al., 2004). Social interaction is the most important element for children and adults in play spaces. Social interaction gives a feeling of belonging, it minimizes social rejection, promotes cooperation and practicing social skills and supports a sense of self in relation to others. An inclusive environment gives all children the opportunity to develop their skills, interest and abilities and supports each child to reach their full potential. (Kiss, 2007).

According to Yanzi et al. (2010) there is a need to advocate for the accessibility and inclusion of all spaces of childhood.
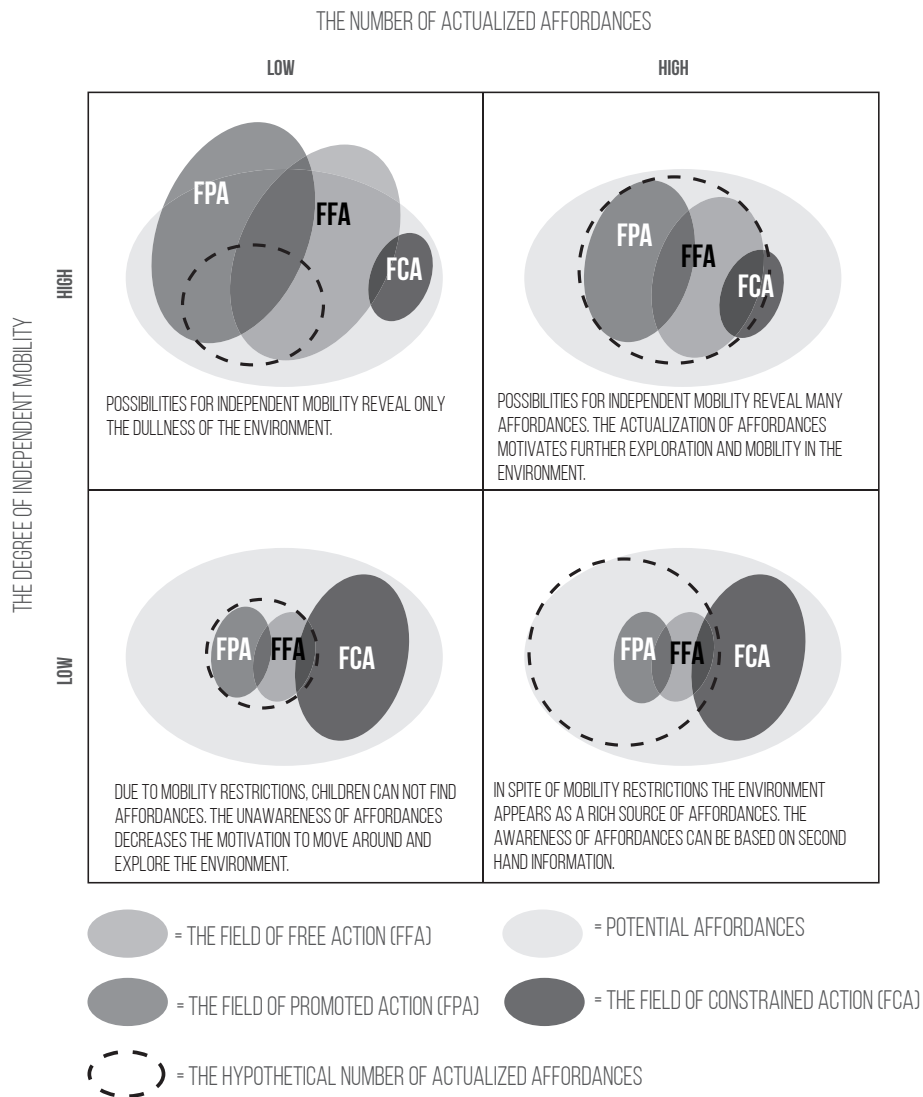
FIGURE 4 PREVIOUS PAGE PARTICIPANT OF THE WORKSHOP AT THE SWEDISH SCHOOL FOR VISUALLY IMPAIRED AND HIS ASSISTANT IN THE SCHOOL'S PLAYGROUND

Giving all children the possibility to play together is a vital step in readdressing discrimination, marginalization and exclusion. Inclusive play spaces help the promotion and creation of inclusive communities.

3.3 ENVIRONMENTAL CHILD FRIENDLINESS

KYTTÄ (2003) HAS studied environmental child friendliness and developed an assessment model for examining child-friendly environments. The model comprises two central criteria for environmental child friendliness: children's possibilities for independent mobility and their opportunities to actualize affordances. Affordances are environmental opportunities, meaning that objects are not perceived as such, but are rather perceived as opportunities for action and functional values i.e. objects offer themselves to be grabbed, twisted, lifted, etc. and surfaces exist to be run, climbed or slid on etc. (see table 2). The model is built on the idea that the co-variation of independent mobility and the actualization of affordances define four qualitatively different types of children's environments. The hypothetical environmental types are Bullerby, Wasteland, Cell, and Glasshouse. The Bullerby type represents a child-friendly environment, as it allows a positive interactive cycle to develop between a child and the environment. Sufficient possibilities for independent mobility enables a child to discover environmental affordances, and actualized affordances motivate the child to move around more in the environment creating more possibilities for new affordances to become actualized. Bullerby represents an environment that does not exclude children from everyday life.

The varying environmental situations in the model are interpreted on the basis of the fields of promoted, free, and constrained action (see figure 2). The opportunities for the actualization of affordances vary in the four environments. In the Glasshouse type a large number of affordances remain passively perceived as the limited size of the fields of free action make the actualization of affordances difficult. The environment is diverse and attractive, but it cannot be accessed freely. An example of a Glasshouse type of situation is when a child familiarizes herself extensively with the environment, but only through her parents' assistance. In the

THE NUMBER OF ACTUALIZED AFFORDANCES

LOW / HIGH

THE DEGREE OF INDEPENDENT MOBILITY

HIGH / LOW

POSSIBILITIES FOR INDEPENDENT MOBILITY REVEAL ONLY THE DULLNESS OF THE ENVIRONMENT.

POSSIBILITIES FOR INDEPENDENT MOBILITY REVEAL MANY AFFORDANCES. THE ACTUALIZATION OF AFFORDANCES MOTIVATES FURTHER EXPLORATION AND MOBILITY IN THE ENVIRONMENT.

DUE TO MOBILITY RESTRICTIONS, CHILDREN CAN NOT FIND AFFORDANCES. THE UNAWARENESS OF AFFORDANCES DECREASES THE MOTIVATION TO MOVE AROUND AND EXPLORE THE ENVIRONMENT.

IN SPITE OF MOBILITY RESTRICTIONS THE ENVIRONMENT APPEARS AS A RICH SOURCE OF AFFORDANCES. THE AWARENESS OF AFFORDANCES CAN BE BASED ON SECOND HAND INFORMATION.

= THE FIELD OF FREE ACTION (FFA)

= POTENTIAL AFFORDANCES

= THE FIELD OF PROMOTED ACTION (FPA)

= THE FIELD OF CONSTRAINED ACTION (FCA)

= THE HYPOTHETICAL NUMBER OF ACTUALIZED AFFORDANCES

Wasteland type, the extensive fields of promoted and free action do not result in a large number of actualized affordances because the environment does not provide things to discover; its affordances are few or non-diverse. Dull living environments, such as sleepy suburbs, can fit the Wasteland type. In the Cell environment the restricted fields of free and promoted action make it impossible for children to explore the affordances of the environment. The potential affordances are not even perceived, and therefore used or

FIGURE 5 A MODEL FOR DESCRIBING FOUR HYPOTHETICAL TYPES OF ENVIRONMENTS THAT EMERGE FROM THE COVARIATION OF CHILDREN'S INDEPENDENT MOBILITY AND THE NUMBER OF ACTUALIZED AFFORDANCES. (KYTTÄ, 2003)

ENVIRONMENTAL QUALITIES THAT SUPPORT CERTAIN AFFORDANCES	AFFORDANCES	ENVIRONMENTAL QUALITIES THAT SUPPORT CERTAIN AFFORDANCES	AFFORDANCES
FLAT, RELATIVELY SMOOTH SURFACES	AFFORDS CYCLING AFFORDS RUNNING AFFORDS SKIPPING AFFORDS SKATING AFFORDS PLAYING HOPSCOTCH AFFORDS SKIING AFFORDS PLAYING (FOOTBALL, ICE HOCKEY, TENNIS OR BADMINTON)	ATTACHED OBJECTS NONRIGID ATTACHED OBJECT CLIMABLE FEATURE	AFFORDS JUMPING OVER AFFORDS JUMPING DOWN FROM AFFORDS SWINGING ON AFFORDS HANGING AFFORDS CLIMBING AFFORDS LOOKING OUT FROM
RELATIVELY SMOOTH SLOPES	AFFORDS COASTING DOWN AFFORDS SKATEBOARDING	SHELTER	AFFORDS HIDING AFFORDS BEING IN PEACE AND QUIET
GRASPABLE/ DETACHED OBJECTS	AFFORDS THROWING AFFORDS DIGGING AFFORDS BUILDING OF STRUCTURES AFFORDS PLAYING WITH ANIMALS AFFORDS USING PLANTS IN PLAY	MOLDABLE MATERIAL (DIRT, SAND, SNOW) WATER	AFFORDS MOLDING SOMETHING AFFORDS BUILDING OF SNOW STRUCTURES AFFORDS SWIMMING AFFORDS FISHING AFFORDS PLAYING WITH WATER

ENVIRONMENTAL OPPORTUNITIES FOR SOCIALITY	AFFORDANCES FOR SOCIALITY
	AFFORDS ROLE-PLAYING AFFORDS PLAYING RULE GAMES AFFORDS PLAYING HOUSE AFFORDS PLAYING WAR AFFORDS BRING NOISY AFFORDS FOLLOWING/SHARING ADULT'S BUSINESS

TABLE 2 AFFORDANCE CATEGORIES FOR CHILDREN'S ENVIRONMENTS AS DESCRIBED BY KYTTÄ (2002).

shaped. An environment like this can be any setting where children are locked inside and they cannot receive the versatile affordances of the outdoor environment.

3.4 RESEARCH ON THE ACCESSIBILITY OF PLAYGROUNDS

A STUDY CONDUCTED in a municipality in Sweden (Prellwitz et al., 1999) explored the attitudes toward accessibility problems in playgrounds among the "creators" and "users of playgrounds". The results showed that those who created playgrounds had a fragmented organization, insufficient knowledge of disabilities, poor economy and attitudes as an obstacle. Similar findings were discovered in a British research (Dunn et al., 2004) studying the development of accessible play spaces. They interviewed playground amenities officers, planners, manufactures, disabled children and their families and their representative campaign groups. The instances involved in developing accessible play spaces, officers, planners and manufactures, felt that a lack of knowledge about the effects of certain impairments inhibits their ability to develop accessible play space. The disabled children and their parents wished that play providers shifted their focus away from the problems impairments presumably cause and concentrated on children and removing the social and environmental barriers that lead to segregation and exclusion instead. Campaign group representatives pointed out that thinking beyond the functional limitations of an individual child enables a more creative view at ways of solving the problems caused by disabling environments, barriers and cultures. Playground amenities officers pointed out that purchasing special equipment for disabled children leads to segregation. The families of disabled children noted that all the pieces of equipment in a playground do not need to be accessible to all disabled children in order for the playground to be inclusive. Both disabled and non-disabled children need a wide range of different play opportunities. Non-disabled and disabled children want to play together and like to use equipment that can be used together with others. The siblings of disabled children expressed sadness and discomfort at exclusion of their brothers and sisters from a play space. The inaccessibility of play opportunities creates vulnerability for families with disabled children.

Disability occurs because of the way we design the environment. It's not a given. Children have impairments, but disability is a moveable thing depending on how environments are designed and what people's attitudes are. Campaign group representative (Dunn et al., 2004)

No we haven't thought about accessibility, not a jot, that's the long and short of it. All I can say is, I have memorized nearly all the playgrounds and we simply haven't been thinking along those lines.

We talked about it (accessibility), but we said that if you are wheelchair bound you can at least get into this playground and get to the centre of the playground; from there, we said, they always have someone with them who can carry the child. Creators (Prellwitz et al., 1999)

A research done in Ankara, Turkey, (Talay et al., 2010) pointed out that playgrounds should not be designed exclusively for disabled children, creating isolating disabled parks, instead they should accommodate the needs of all children and encourage social inclusion by means of play activities and allow all children to use the play equipment independently and on equal terms. At present the playgrounds are not usable for children with restricted mobility due to physical barriers. The fact that playgrounds and playground equipment are not designed for children with restricted mobility forms an obstacle. Another obstacle preventing disabled children from using playgrounds is the lack of a suitable ground cover. The choice of ground material has a significant impact on the accessibility of a playground and was highlighted in many studies as in the research (Yanzi et al., 2010) evaluating the physical environments of five school playgrounds for physically disabled children in Toronto Canada. The study showed that at least four of the playgrounds failed to protect and support the spatial rights of disabled children. The studied playgrounds had many features that resulted in spatial othering and exclusion, including the use of inaccessible surface areas and the dominance of inaccessible elevated play components. The type of surface material can form a remarkable barrier for disabled children. In many of the playgrounds physically disabled children could not get into the playground, move around or play. The

children could only play with approximately 17-50% of the components. Physically disabled children can be limited in the number of components that they can play with as well as the diversity of their play experience. This can prevent them from learning important physical, social and emotional life skills.

Similar examples are found in a study examining how children with different abilities experience usability in playgrounds (Prellwiz and Skär, 2007b) Sand was the biggest obstacle for children with restricted mobility. Children using mobility devices felt that the equipment was too small for them to manoeuvre around. For example if the child could enter a playhouse using a wheelchair they could not turn around inside the playhouse and had a difficult time trying to get out. They did not visit playgrounds frequently. The children with visual impairments had challenges in seeing stairs and barriers. All disabled children stated that they did not want to try certain playground equipment when other children were present for fear of not using it in the right way and being teased by others. The non-disabled children did not mention any problems in using playground equipment. For them the playground was their place where they spent a lot of time.

She wants to go around with the other children, but the crutches sink in the sand and she falls over.

If there had been paths up to the play equipment, and proper supporting rails on the play equipment, the accessibility would have been vastly improved. User's parents
(Prellwitz et al., 1999)

Many of the studies highlighted the need for removing social as well as physical barriers at playgrounds. All the children that took part in the British research (Dunn et al., 2004) felt that it is important that they have access to open accessible play space in which they will not be laughed at, rejected or made fun of, but included as ordinary children. Disabled children and their families pointed out that accessible public play spaces offer a unique chance for the building of children's relationships. Play can provide a way of building and sustaining a sense of community membership for

children. The findings of the research done in Turkey (Talay et al., 2010) show that social barriers can be a remarkable reason for disabled children to avoid the use of playgrounds even though the playground would be accessible to them. This indicates that playground equipment should be designed to allow all the children the opportunity of integrated play. The playground should be designed following inclusive approaches; it should be designed to ensure increased play activities and allow all children to interact together, and playground equipment should be designed to be accessible to all. Inclusive approaches should also involve social inclusion in a playground.

Prellwiz and Skär's study (2007b) showed that all children, regardless of their abilities had experienced playgrounds and that they were considered special places they did not want to be without. The children stated that the most important function the playground had was to offer social interaction with peers. The study indicated that even though playgrounds are essential environments for all children, regardless of their abilities, they are not accessible and usable for all and do not fully support play activities for children with disabilities. According to the study a playground should not only be a place for physical play activities, but should be a meeting place where play and social interaction take place. The playground was a meeting place for the non-disabled children, a place where you never played alone. The disabled children experienced the playground differently; they were rarely with friends at the playground. None of the disabled children mentioned ever making new friends at the playground. According to the findings the children with disabilities lacked numerous opportunities to use the playground environment and if they could use it they were not on equal terms with other children. All children described the playground as a place for activities that posed some kind of challenge. The sorts of challenges disabled children described were for example trying to use play equipment they had never tried before or to do an activity without an adult there to assist them.

According to Prellwitz (1999) Two themes rose in the interviews with the users of playgrounds; the playground is not for me (i.e. for children with restricted mobility) and assistance is a precondition for accessibility. The children's experiences showed clearly that they felt excluded from the play environments. At best, they were spectators of other children's play or completely outside

these contexts. The children cannot even get into the playground, often due to too narrow openings in the fences or sand that began right at the entrance. One boy said that he could see the playground where his friends played from his window. He could not take part, because he could not drive his wheelchair into the playground. The playgrounds that are accessible to enter rarely had accessible equipment. The children can get into the playground but cannot play. According to the children the traditional types of play equipment (slide, roundabout and swings) are not accessible to children with restricted mobility unless there is an attendant adult from whom to seek assistance. The children are often not able to get to the play equipment by themselves, therefore they are dependent on the help of adults (parents or assistants). These adults are able to help the children only as long as they can manage to lift and carry them to the play equipment. The assistants described that it is psychologically trying, when they can no longer manage to lift and carry the children and are forced to deny them the possibility to play in the playgrounds. The constant dependency on the presence of an adult in a playground can form an obstacle to spontaneous contacts with other children for a disabled child. The need for assistance was also highlighted in the research conducted by Dunn (2004) Parents had experienced risking their own health and safety through lifting their disabled child to access certain pieces of equipment. Safety representatives recognize that play spaces are not only for children but also for parents and caregivers since many disabled children need personal assistance.

The eighteen parents interviewed in a Swedish study, aiming to gain understanding of parents' perception of how playground designs influence their children with disabilities, perceived that the designs influenced their children in various negative ways. The parents perceived that playgrounds made their children feel insecure, embarrassed and different from their peers and their children therefore avoided going to playgrounds. Playgrounds were also a place avoided by the parents as a "stigma management technique". Parents felt anger toward the society and questioned why nothing was done about playground accessibility for children with disabilities. Parents described that playgrounds influenced their children by hindering them from performing play activities on the playground and by limiting participation with other children. The parents perceived that the lack of accessibility caused the lack of

possibilities to participate and made their children more dependent on them, the parents. (Prellwitz1 and Skär, 2007a)

'I can play too':The Good Play Space Guide (2007) was prepared by the Playgrounds and Recreation Association of Victoria through research and consultation with children with a disability, parents, local government, manufacturers and the education sector. The research showed that the critical elements defining an accessible play space are that children can get into the play space and move around, play with others, find enjoyable stimulating things they can do and be supported by facilities suited to their needs. The parents wished for accessible paths, age-appropriate and enjoyable equipment for children with a range of abilities and sensitivities as well as accessible support facilities. The parent's taking part in the British research (Dunn et al., 2004) wished for clean play spaces, since litter, graffiti and dog mess can disadvantage disabled children who may explore the environment through touch, smell or taste. Parents also wished for signs and notice boards welcoming disabled children and their families to public playgrounds, and quiet areas and comfortable spaces. Children and their families noted that the trick to designing good accessible play spaces is to make sure there are contrasting play opportunities – sensory enjoyment as well as empty space. According to the study an accessible play space should offer all children access to the social experience of play.

In the study by Prellwiz and Skär (2007b) the children described the swings as the center of the playground as well as the most important and usable play equipment. For the children with disabilities they were the most wished-for place to be in the playground. All the children wished for more recognizable things, houses, cars and boats that promote role-playing and enable social gathering in the playground. Play equipment that promotes fantasy and role-playing can also encourage more social interaction between children. The activities that these play equipment generated appeared to hold the children's interest for a longer time than jungle gyms and slides.

The study indicates that instead of focusing solely on the accessibility of playground equipment it is important to concentrate on designing opportunities for interaction. The playground environment should support a range of physical challenges, promote interaction and communication and give children a choice of challenges.

3.5 ANALYSIS OF EMIL AALTONEN ACCESSIBLE PLAYGROUND

THE EMIL AALTONEN playground in Tampere was renewed with accessibility in mind and it opened up for public on the June 4, 2012. (www.tampere.fi) The whole playground is not accessible; a smaller play area covered in turf is dedicated to accessible play while the rest of the play areas are covered in soft sand. The playground is a good example of how the surface material affects the accessibility and playability of the whole playground. Sand makes half of the playground inaccessible to children with walking difficulties and children using a wheelchair. The equipment for the accessible play area has been chosen so that they suit all children especially those with physical or visual impairment. They consist of carousels, a wheelchair accessible play unit, a xylophone, spring riders, parallel bars, a baby swing and a bigger swing with a backrest. There is a tactile guide for visually impaired near the entrance to the accessible play area. The tactile map only shows the accessible part of the

playground. Wooden animals and formula cars are situated in the non-accessible area of the playground in the soft sand and are not shown in the tactile map. There is also a sand table next to the sand box for wheelchair users in the other play area. The fact that there is a separate accessible area in the playground with a tactile map illustrating the area alone seems very segregating. Also the selection of equipment determined as accessible clearly shows that there is a lack of versatile, playable and accessible play equipment in the market.

FIGURE 7 DIFFERENT EQUIPMENT IN THE EEMIL AALTONEN ACCESSIBLE PLAYGROUND

3.6 CONCLUSION

ALL CHILDREN CONSIDER playgrounds special places they do not want to be without. They are essential environments for all children, regardless of their abilities. However the disabled children's experiences show that they feel excluded from the play environments and feel that the playground is not a place meant for them. In the worst case the children cannot even enter the playground and are merely spectators of other children's play. Disabled children are often dependent on the assistance of an adult. The inaccessibility of playgrounds affects disabled children in multiple negative ways such as making them undergo feelings of insecurity, embarrassment and being different from their peers.

Playgrounds have many features that cause spatial othering and exclusion, such as inaccessible surface areas and elevated play components. Along with improving the accessibility of playground equipment it is essential to design opportunities for interaction as well. Play equipment should support a range of physical challenges, provide different play opportunities and promote interaction. While designing playgrounds one should think beyond the functional limitations of a certain child and find more creative ways of solving problems caused by disabling environments and barriers.

According to the children the most important function of the playground was to offer social interaction with peers. Interaction with peers is equally as important as performing physical activities at a playground. The need for social inclusion was highlighted by the different researches. The studies show that disabled children lack multiple opportunities to use the playground. However there is no need for playgrounds designed exclusively for disabled children. Playgrounds should accommodate the needs of all children and encourage social inclusion and allow all children to use the play equipment independently and on equal terms. From the different studies done around the subject of playground accessibility one can conclude that existing playgrounds represent Glasshouse and Cell environments for disabled children. Playgrounds are attractive but cannot be accessed freely or at all. The children have restricted or no possibilities to engage in play and explore the environment independently.

4 METHODOLOGY

4.1 QUESTIONNAIRE FOR PARENTS

I WANTED TO involve the parents of children with restricted mobility or eyesight and hear their experiences of existing playgrounds and wishes for an ideal playground. Playgrounds are not used solely by children but also by adults who accompany their children there. Parents also often know and can best point out their children's needs. Children with restricted mobility or eyesight are also often dependent on the presence of an adult assistant. The parents of able-bodied children can also have restricted mobility or eyesight and face difficulties in operating in existing playgrounds.

The questions were formulated on the basis of the background research findings and the questionnaire aimed at qualitative information on parent's experiences, hopes and wishes of an ideal playground. The questionnaire contained seven multiple choice questions and eight open ended questions, from which the respondent could choose to answer all or the most relevant ones. The first seven questions described the background of the respondent, was the respondent a male or female, how many children he/she had and how old they were, how frequently they visited a playground and who accompanied the child there, and also if the respondent had a special needs child or had restricted mobility or eyesight him/herself.

The link to the questionnaire was sent to three Finnish organizations, Mahdollisuus Lapselle ry and Leijonaemot, which are support associations for families with disabled children, and Silmäterä, a support association for families with blind children. It was also posted on the blog page, Playground dreams, that I started

PARENTS OF CHILDREN WITH RESTRICTED MOBILITY OR EYESIGHT

QUESTIONNAIRE FOR PARENTS

STAFF MEMBERS SPECIALIZED IN REHABILITATING CHILDREN WITH RHEUMATISM

EXPERT INTERVIEW

CHILDREN WITH RESTRICTED MOBILITY OR EYESIGHT AND ABLE-BODIED SCHOOL CHILDREN

CO-DESIGN AND EVALUATION WORKSHOPS
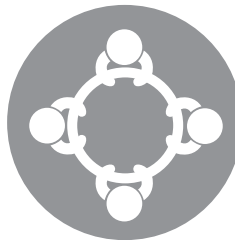
TO ENGAGE PEOPLE INTERESTED IN THE SUBJECT, ESPECIALLY PARENTS OF CHILDREN WITH DISABILITIES

BLOG - UTILIZING SOCIAL MEDIA

as a part of my research and the blog's Facebook page, both in English and Finnish. The questionnaire link was open two months from March to April 2012 and an email reminding of the questionnaire was sent to the associations in the beginning of April. A total of 21 answers were collected, 20 people answered the Finnish questionnaire and one person answered the English questionnaire, posted on the blog page.

4.2 EXPERT INTERVIEW

AN EXPERT INTERVIEW was conducted at the rheumatism rehabilitation department for children at Orton foundation on April 3, 2012. Orton foundation is a private clinic, hospital and rehabilitation center in Helsinki. Five staff members specialized in treating and rehabilitating children with rheumatism were present: an occupational therapist, a physiotherapist, a physiotherapist student and nurses. The interview focused on defining the different challenges children with rheumatism have, their capabilities and hearing an expert view on which kind of exercises they would benefit from.

FIGURE 9 TASK SHEETS USED AT THE EXPERT INTERVIEW
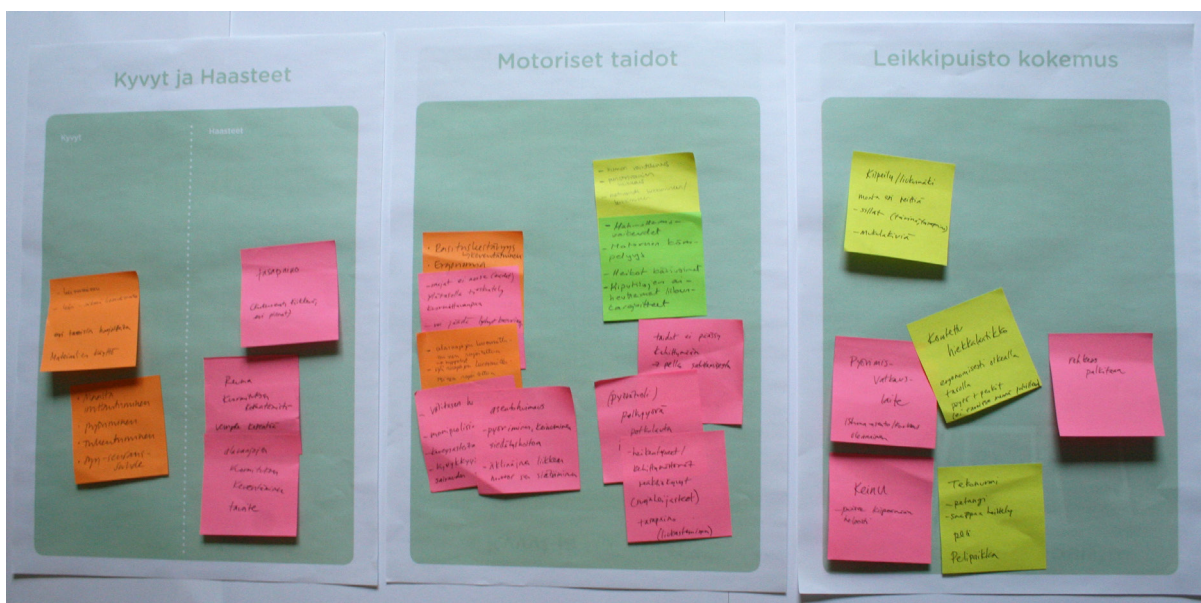
4.3 CO-DESIGN WORKSHOPS WITH CHILDREN

THE GOAL OF the co-design workshops was to include the end users of playgrounds, children, in the design process. The different tasks were designed to map out the experiences of both able-bodied and physically disabled children and their wishes and hopes for a dream playground and to aid them in ideation and molding dream playground equipment. I hoped to hear the children's insights on what kind of equipment they would prefer and what would suit their needs and to see whether they would come up with novel ideas or solutions to fit their needs.

The participants for the three co-design workshops came from three different Helsinki-based schools, Länsi-Pasila primary school, the Swedish school for Visually Impaired, and Ruskeasuo school. The Swedish school for Visually impaired and Ruskeasuo school are special schools for visually impaired and physically disabled children. Ruskeasuo school is a state-owned special

school providing comprehensive education. Eighty-three children and youths currently study there. The Swedish school for Visually impaired has four students studying there at the moment.

The three workshops varied from each other a little. The workshop for able-bodied children was held as a part of an industrial design afternoon club activity and the playground equipment was made into finished models. The scale model of the dream playground was shown at the design club's final exhibition in the Designmuseum located in Helsinki in May 2012. Due to the fact that only two visually impaired children both with communication difficulties were present at the second workshop the tasks were modified to fit the participants.

An assistant was present at the workshops taking pictures. A camera was placed on the workshop table facing away from the participants to record the conversations and quotes from the children. The tasks were designed so that the participants wrote down their thoughts on separate pieces of paper that were collected and analyzed after the workshops. Pictures were taken of the molded playground equipment.

There were three different tasks in the workshops. The first one aimed at finding out the children's experiences of existing playgrounds. The second task was to collect ideas for a dream playground and in the third task the children could design and produce their own play equipment ideas. The first task consisted of three different questions: What do you like in playgrounds? What do you not like in playgrounds? What would your dream playground be like? The children were given figures cut from colored paper to write down their thoughts. A yellow house shaped paper represented the present playground, disliked things at the playground were written on an orange storm cloud shaped paper and a blue cloud shaped paper was for the ideas for a dream playground. The questions were asked one at a time and the children had time to write down their thoughts. Then the theme was discussed together as a group and everyone had a chance to share their experiences. The second task was done on the wall to form an idea board . I placed trees cut from paper on the wall to form an imaginary playground on the wall and asked the children to suggest what to add in the playground to make it their dream playground. Either the children or I wrote the ideas on post it notes and added them on the wall.

Each child was given modeling clay for the third task. They were asked to mold their dream playground equipment.

The experiences and dreams task in the workshop was based on co-design tasks developed by Sara Ikävalko for co-designing with people with special needs. Ikävalko has been consulted orally.

1. EXPERIENCES AND DREAMS TASK
WHAT DO YOU LIKE IN PLAYGROUNDS?
WHAT DO YOU NOT LIKE IN PLAYGROUNDS?
WHAT WOULD YOUR DREAM PLAYGROUND BE LIKE?

2. WHAT WOULD YOU ADD TO THIS PICTURE TO MAKE IT YOUR DREAM PLAYGROUND? DONE TOGETHER TO COLLECT IDEAS AND TO FORM AN IDEA BOARD.

3. MOULD YOUR DREAM PLAYGROUND EQUIPMENT
WHAT IS IT? HOW IS IT USED?

4.4 EVALUATION WORKSHOPS WITH CHILDREN

THE AIM OF the evaluation workshops was to find out what children think about the developed play equipment, and to validate whether the notions made in the co-design workshops that were included in the end design had been right. I wanted to find out whether I had achieved my goal of designing playground equipment that suit and interest disabled children as well as non-disabled children.

The participants for the two evaluation workshops came from Ruskeasuo school and Espoo based Laajalahti primary school. Since a lot of time had passed from the co-design workshops it was not possible to find the same participants for the evaluation workshop. I chose to do two workshops, one with able-bodied school children and another with physically disabled children to evaluate weather the children's perception of the play equipment varied according to their skills.

An assistant was present at the workshops taking pictures. A camera was placed on the workshop table facing away from the participants to record the conversations and quotes from the children. First the animation of the characters was shown and then the concept and pictures of each play equipment. The participants were given an evaluation sheet where they were asked to write down their thoughts about the concept. Designing the evaluation sheet was challenging, since it was difficult to know what kind of skills the participants at the Ruskeasuo school workshop have, for example I did not know beforehand whether they can write or comprehend difficult questions. I tried to make it as simple as possible. The evaluation workshop started with the animation to introduce the different characters and their signature sound. Then the different play equipment was shown one at a time. After the presentation the evaluations sheet was handed to the participants. The first task was to test the participant's first reaction to the concept; are they

excited or do they feel that it is ordinary and does not offer much new. The second task was to find out their thoughts about the separate equipment and in the third task they got to choose their favorite piece of equipment and explain why. After filling the evaluation sheet each child got to explain in their own words which piece of equipment they liked most and why. I included an extra question about the game application for the able-bodied school children to find out their thoughts about using it. I did not present the idea of a mobile phone game application to the children with physical disabilities because primarily I wanted feedback on the play equipment and I did not want to confuse the children. The evaluation sheets were collected and analyzed after the workshops.

1. WHICH DESCRIBES THE PLAYGROUND EQUIPMENT BEST? CIRCLE. JEY! I WANT TO TRY! ORDINARY WONDERFUL ANIMALS BORING FUN CHILDISH OKAY I CAN!

2. DESCRIBE THE PLAY EQUIPMENT IN YOUR OWN WORDS. WHAT'S GOOD AND WHAT'S BAD?

3. WHICH PIECE OF EQUIPMENT DO YOU LIKE MOST? WHY?

GAME APPLICATION WHAT DO YOU THINK ABOUT A GAME LIKE THIS? WOULD YOU USE IT? WHAT MORE COULD YOU DO IN THE GAME?

4.5 BLOG – UTILIZING SOCIAL MEDIA

SOCIAL MEDIA AND especially blogs gain a lot of attention at present and are a medium that many people follow. I wanted to test the use of social media for idea generation and the search for best practices with an engaging blog. I started a blog called Playground dreams with the intention of finding and sharing interesting and inspiring products, phenomena and experiences around the subject of accessible play equipment. I aimed to engage people interested in the subject, especially parents of children with disabilities and hoped that they would share their ideas, experiences and wishes. I also

started a Facebook page for the blog to raise awareness of the blog.
I shared a link to the blog in different Facebook groups (for exam-
ple Moms), on other playground blogs, on child magazine forums
such as meidanperhe.fi as well as in the questionnaire for parents
with disabled children to gain awareness and followers. I started the
blog on January 24th and continued it until the background and
idea generation phase of my work ended in June 2012. Overall it
was updated for a five-month period.

FIGURE 13 SCREENSHOT OF THE BLOG PAGE

5 RESULTS AND ANALYSIS

5.1 QUESTIONNAIRE FOR PARENTS

5.1.1 RESULTS OF THE QUESTIONNAIRE

TWO MEN AND 19 women answered the questionnaire. A majority of them had one to two children and the rest had three, or four to ten children. The children's ages varied from four months to nineteen years, most of them being either under six or primary school aged. Seventeen respondents had a special needs child and two parents had restricted mobility or eyesight. Most of the children went to a playground weekly or many times during a week, five children visited a playground monthly or rarely and one child never spent time at a playground. Most often the children were accompanied by their parents in the playground.

NOTIONS OF A PLAYGROUND – PLAY, NATURE AND FRIENDS

For the majority of respondents the word playground represented a safe interesting place for children to play with others. Some of the respondents also felt that playgrounds are a place where both children and parents can meet others and parents can get peer support from each other. A few respondents felt that the playground is a dull place especially for parents, involving a lot of standing around and watching over the child, the playground was seen as a broad gloomy space where all interesting play opportunities - caves and hut building opportunities have been removed.

MOST COMMON ACTIVITIES AT A PLAYGROUND

The children most commonly swing, play in the sandbox, slide or run around at the playground together with their parents and other children. Some children ride pedal cars or tricycles, climb obstacles or play soccer or floor ball. Four respondents mentioned that carrying out most of the activities requires the support of the parent. One respondent said that the child has difficulties in concentrating on any other activities than swinging, and wanders around the playground. One child who has poor eyesight and problems in keeping balance is guided by the parent at all times and can climb and build sand structures when assisted. One answerer has a six-year-old boy who is severely disabled, moves with a wheelchair and can stand or sit only when supported. The parent has not found a single activity the child can do at a playground and therefore they do not go to playgrounds.

OBSTACLES AND HAZARDOUS CHALLENGES

The sand covering the playground forms an obstacle to children using walking aids and wheelchairs, for them it is difficult or even impossible to move around in the soft sand. Uneven surfaces, thresholds and the rugged edges of safety surfaces make it difficult for children to move around independently. Low obstacles and difference in heights make it unsafe for a child who cannot see three-dimensionally to move around. Lacking color contrasts in climbers cause tripping and falling hazards when the child cannot see where the steps end and the slide starts. Bright sunshine also makes seeing difficult. For a visually impaired child it is also difficult to see when the slide is free of other children. The fact that the swinging and riding areas are not confined from the other play areas causes hazards for visually impaired children and parents. A visually impaired parent reported difficulty in guiding her visually impaired child at the playground. Many reported that the slides and the steps to the slides and climbers are too steep. The steps to the slides are too high and often slippery and the sun heats the slides making them burning hot. The climber paths are often too narrow for assistants to aid the child. The lack of handrails reduces the possibility for children with walking difficulties to move around independently. Several respondents stated that the swings are too high and they should be hanging from different heights. One respondent described that the swings hanging high make it difficult

for her blind child to reach and climb into. The lack of backrest also prevents children with problems keeping balance from swinging. Older children who cannot keep their balance do not fit in the baby swings and are afraid of swinging in a normal swing. Pedal cars and tricycles are too small for bigger children who wish to use them. The lack of maintenance and cleanness were also reported as problems at the playground. Several respondents were afraid of litter, pieces of broken glass and drug needles. One respondent stated that the biggest challenges are inside the child's head, a lack of confidence and difficulty to begin and perceive activity.

SOLUTIONS FOR CHALLENGES

The respondents offered multiple solutions to the challenges their children faced at playgrounds. Swings should be at different heights and have different models i.e. bigger swings with backrests and nest swings. The surface should be as even as possible and preferably rubber. One respondent wished for different ground materials in different play areas so one could make out in which area one is. Colorful paths leading to equipment would make moving around easier and handrails would support independent moving. Contrasts in slides and climbers and clearly colored play equipment would make them more safe and easy to notice. Better maintenance and lighting would make the playground safer, as well as clearly visible fences. Slides could be made less steep and safer, with sides and safe landing. There could be more slides so shy children can take their time in practicing sliding. Planting trees would give shadow. Colorful equipment could lure a shy child. The climbers should not be too challenging or dangerous looking for uncertain and timid children. Play equipment that can be used in a wheelchair, with an assistant or ones that a have a seat with sufficient support and safety belting would enable wheelchair users to participate. One respondent stated that it is difficult to solve social challenges. Other small children cannot be expected to help her child and other parents do not understand or are not aware of the problems.

WISHED FOR ACTIVITIES

The most wished for activity that the respondents stated they want their children to be able to do at a playground is that the children could move around safely, freely and independently. Most of them also wanted their children to be able to swing, slide or climb

THE BIGGEST CHALLENGES AT PLAYGROUNDS

THE INACCESSIBILITY OF THE SURFACE MATERIAL

LACK OF SHADE AND COLOR CONTRASTS

INSUFFICIENT SAFETY AREAS AROUND EQUIPMENT

UNEVEN SURFACES AND LOW OBSTACLES

TOO STEEP STEPS TO SLIDES

TOO NARROW PASSAGES THAT DO NOT ALLOW AN ASSISTANT TO AID THE CHILD

SWINGS HANGING ON THE SAME HEIGHT

LACK OF BIGGER SWINGS WITH A BACKREST

BIGGER CHILDREN CAN NOT USE THE TODDELER EQUIPMENT THAT ENABLE BETTER SUPPORT

CHILDREN ARE CONSTANTLY DEPENDENT ON THE HELP OF AN ADULT

independently. One wanted her child to be able to sit in a carousel in a wheelchair and one wanted her child to be able to climb on the rocks freely with other children.

AN ENJOYABLE PLAYGROUND

A majority of the respondents stated that the most important factors that make them enjoy spending time at a playground are safe, exciting and versatile play equipment that offers many play opportunities and friends and company at a playground. A clean, bright and peaceful environment with good visual contact over the area also makes the playground enjoyable. Some enjoyed park- like playgrounds with beautiful plants. Benches for parents and shelter from wind and sun as well as play equipment in good condition were appreciated. An even surface makes the playground safe and usable. One respondent valued safe corners for the child to play alone if the overall action in the playground gets too wild. Another respondent stated that the most important factor in an enjoyable playground is the ability for her child to play with others as equally as possible.

DREAM PLAYGROUND AND WISHED FOR PLAY EQUIPMENT

An ideal dream playground would constitute of elements such as safe versatile play equipment that keeps the child's interest and develops motoric skills, benches, shelters, picnic tables, a sufficient amount of garbage bins, natural elements like wood trunks, plants, water elements, fruit trees, different surfaces and materials, good lighting and visual contact, and happy people that are open to familiarizing with others and the parents of special needs children. The respondents wished that play equipment would be distinct, stable, colorful and inspiring and support creative play. They should also be easy to use and available at low levels. The respondents wished for play equipment such as swings, sand box, slides for different aged children, climbers, pedal cars, carousels, play hous-es, huts, hammocks, balancing equipment, ball walls, trampolines, winter equipment (heijjakka), cars, play kitchens, sand toys and bicycles. One mother had consulted her children and their wishes for a dream playground were: grass, trees, rocks, sand box, a swing for the baby and the older children and a wide round swing (nest swing) where that wheelchair dude can also go. The mother herself wished for happy companions.

ACCESSIBLE PLAYGROUND

The questionnaire included a question with a picture of a group of people, some able-bodied children and adults of different ages and a child in a wheelchair, asking what should the playground be like so that all the people could enjoy it together. Most of the respondents replied that the playground should be spacious and it should have accessible surface material and clear paths leading to equipment. According to the answers it should be safe, have fencing, take all users into consideration and fit many needs and abilities. The playground should offer different opportunities for play, ramps for children in wheelchairs, comfortable seating in different levels, good lighting, age recommendations on equipment and clear boundaries with sound identification. Exercise equipment could also have instructions in braille. One respondent noted that especially the parents at the playground should be tolerant and open-minded.

5.1.2 CONCLUSION OF THE QUESTIONNAIRE

THE FINDINGS OF the questionnaire are in line with the different studies done on the accessibility of playgrounds abroad. The answers highlighted the main challenges that physically and visually impaired children face – the inaccessibility of surface areas being one of the most common ones. Children are also not able to move around the playground independently, most of them are dependent on the constant presence of an adult. According to the findings most of the children with special needs visited a playground frequently. One severely disabled child using a wheelchair had no play opportunities at the playground and never spent time there. A majority of the parents had good experiences at playgrounds and conceived the playground as a safe positive place for their children to play at. Most of the respondents wished that the playground would support and enable their child to move around and play independently. Only one respondent brought up the issue of equal play, that she wanted her child to be able to play in equal terms with others.

All of the children faced some kinds of hazardous challenges at the playground and were not able to use all of the play equipment. The biggest challenges were the lack of shade, color contrasts and clear boundaries between equipment, inaccessible surface material, uneven surfaces and low obstacles, too steep steps

and slides, too narrow paths that do not allow assistance, lack of handrails, swings hanging at the same height and lack of bigger swings with backrest as well as untidiness and litter. The respondents offered reasonable solutions to the challenges such as adding contrast and coloring equipment clearly, taking an assistant into consideration and creating tempting but not too dangerous looking equipment to motivate timid children. A novel solution in the context of a playground was offered for expressing the boundaries of different equipment - sound identification.

The respondents defined an ideal playground as being safe and bright and providing good visual contact, "good company" as well as distinct, stable, colorful and inspiring play equipment that is easy to use and is available at low levels. The play equipment that was wished for was mostly already existing pieces of equipment such as swings, sand boxes and slides. A sufficient amount of benches, picnic tables, shelters and garbage cans was noted as an important factor effecting how enjoyable the parents found the playground.

I was content that the respondents represented broadly parents with both physically restricted and visually impaired children. There were also two respondents who had physical or visual impairments themselves. The challenges that the children with restricted mobility or visual impairment faced can be universalized to all children to some extent. All children can suffer from dazzling sunlight and the lack of shade and uneven surfaces and low obstacles can cause hazards to all. Good color contrasts and well-marked boundaries between equipment make the playground safer for everyone. All small children often require assistance in slides and climbers and the equipment should support safe assisting of the child. Both able-bodied children and special needs children can be timid and guarded and need to be motivated to move and explore different play opportunities.

5.2 EXPERT INTERVIEW

RHEUMATISM IS AN illness that demands the possibility to avoid straining limbs. The ability level of children with rheumatism varies depending on the state of their illness. The children often suffer

from pain and are therefore overprotected by their parents, which leads to a fear of injuring oneself and prevents them from learning different motor skills. The children are often afraid of moving around and playing. The lack of practice of motor skills causes weakened or undeveloped reactivity skills and poor balance, which often lead to slipping. In some stages of the illness the children's stress endurance is weak and straining lower or upper limbs should be avoided. At times the children have difficulty in raising their upper limbs, their pressing power is weak and the illness can also affect growth and the child can be short in stature. Therefore, play equipment that offers exercises at high climbing level is not suitable for children with rheumatism and there is a demand for exercises at medium level as well as ground level. The exercises should be able to be completed in a good ergonomic position, and they should support diverse levels of effort and challenge. Due to difficulties in perceiving the environment and bad balance, the children would benefit from exercises that expose them to swinging, rotation and sudden changes in movement as well as exercises that require hand and eye coordination, and ones that support learning cause and effect. The most useful equipment, according to the interviewees, is a swing where one can climb in easily and be supported, a spinning equipment in sitting position, a climber and slide which can be reached through various routes, bridges and different surfaces for practicing balance and a sharpened sandbox with ergonomic seats and a table so kneeling down can be avoided. The biggest challenge is to motivate children to move and to confront their fears, which supports learning motor skills.

Even though the expert interview focused on the specific needs of children with rheumatism, the needs and challenges that arose highlight the overall need for diverse exercises done at medium and low level. Children using mobility aids such as wheelchairs and walkers are not the only group of children that would benefit from exercises at medium and low level. Children suffering from rheumatism are good examples of situationally disabled users. Mostly they are capable of moving around freely but at times the pain and the state of their illness prevent them from participating in multiple activities and they require lightened exercises.

5.3 CO-DESIGN WORKSHOPS WITH CHILDREN — PEKKA THE BAMBI SWINGER

5.3.1 FIRST WORKSHOP, ABLE-BODIED CHILDREN - LÄNSI-PASILA PRIMARY SCHOOL

The workshop had ten participants, 9-10 years old able-bodied girls.

1. EXPERIENCES AND DREAMS TASK

Most of the children enjoyed spending time with their friends at the playground. They also likedtube slides, A-swings, spinning in a carousel, swinging, big slides and climbers. The most disliked things at a playground where small children who had to be watched out for and who occupied the play equipment. Sandboxes were also disliked and considered boring. Many also pointed out that messing up was not nice and litter made the playground unpleasant. One child found some swings uncomfortable and one pointed out that falling on sand hurts and especially the combination of asphalt and sand is really hazardous. A dream playground had swings, a carousel, dogs to take care of, really high climbers, a nest swing, an A-swing, no sand boxes, trampolines, an ice cream stall, good hiding places and no teenagers or small children. One child's dream playground had a waterslide, a heated swimming pool and music in the summer and was an ice skating rink in the winter. One wished for an amusement park like playground and one for a frightening horror house to be entered into at midnight. One suggested that there could be different areas for older children and small children. Most children stated that there would be no garbage in their dream playground.

2. WHAT WOULD YOU ADD TO THIS PICTURE TO MAKE IT YOUR DREAM PLAYGROUND?

The idea board collected ideas such as climbers, a zoo, a coke machine, gigantic trampolines, hammocks, an ice cream stall, a beach, a labyrinth with traps, glass maze, benches, cherry trees, rose bushes, garden, beds, animals, chairs, a waterpark, A-swings, a climber from which you can jump into a trampoline and then to foam rubber, a climbing wall, a kiosk, sunbathing, a swing, sliding

down a cable from 10 meters, a slide, a giant world, a soda machine, jokes, a maze, a pencil world, water fountain, a tube slide, swings that can swing to the sky, a game hall, a rotating chair, swings, stairs that take you to a bigger playground, a compartment/locker world, a swimming hall, a candy land, big smiley faces, weird mirrors, acorns, a canopy, ice cream, lots' of mazes, asnail world, a world of sunglasses, elevators going up and down, a gigantic ice cream cone, apples, Hesburger, a trampoline, and a straw world.

3. MOULD A PLAYGROUND EQUIPMENT OF YOUR DREAMS

Using molding clay the children designed swings, a popping fox box, a hot dog stand, two water fountains, a bunny slide, a trampoline with a climbing wall, a turtle, an umbrella shade, a maze and a swirly slide.

FIGURE 15 POPPING FOX BOX
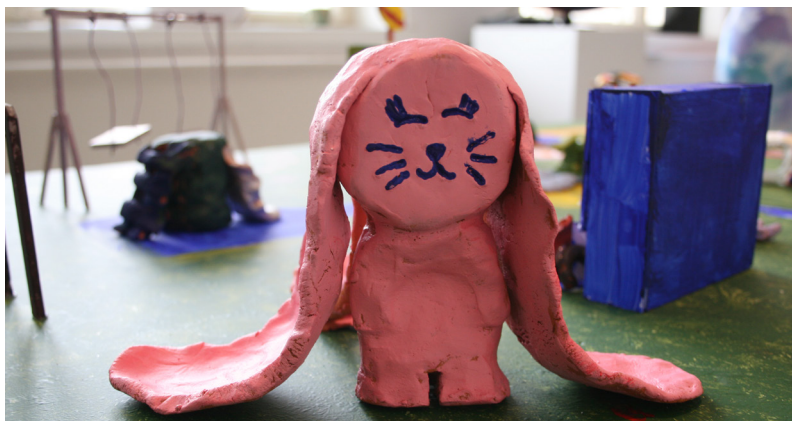
FIGURE 16 BUNNY SLIDE

5.3.2 SECOND WORKSHOP, CHILDREN WITH VISUAL IMPAIRMENT — SWEDISH SCHOOL FOR VISUALLY IMPAIRED

The workshop had two participants, a ten-year-old boy and a six-year-old girl, both blind. In addition to blindness the participants had difficulties communicating and forming sentences so it was challenging to get them to share their experiences and wishes.

1. EXPERIENCES AND DREAMS TASK

The boy felt sorry that a bambi swinger was now too small for him and he no longer fits the equipment meant for smaller children. He also has a tendency to break his bones easily and he had broken his leg while falling off a swing so he was permitted to swing. At present the boy enjoyed swinging in a duck swinger. The girl enjoyed swinging overall. There is a garden swing where many children can swing together in the schoolyard and all the children enjoy it. The boy wished for a baby swing where he would fit and a fountain with purling water.

2. WHAT COULD THE PLAYGROUND SMELL LIKE? WHAT KIND OF SOUNDS COULD THERE BE AT THE PLAYGROUND?

I introduced different smells to the children, coffee, lavender, vinegar and marshmallows and asked which smells they enjoyed and what the playground could smell like. The children proposed that the playground could smell like flowers. I asked the children what kind of sounds there could be at the playground and what kind of sounds could the different equipment make. The participants made a shwooshing sound when we discussed the sound of a slide and a duck sound for the duck swing and buzzing for vehicles. It was agreed that the equipment could make the sound that they would naturally make signaling what they are. The assistant of the boy pointed out that audible beacons are commonly used to aid visually impaired people. One was in use at the school's front door to help navigate to the door. The audible beacons often make a technical repetitive sound and the user needs to know what it stands for and where it guides to.

3. MOULD YOUR DREAM PLAYGROUND EQUIPMENT

The children designed a bambi swinger named Pekka and a duck swing. Pekka the bambi swinger swung fast when ridden on and the

rider could hang on the bambi's neck to stay put. The duck swing made a duck sound and swung slowly and gently.

FIGURE 17 DUCK SWING
FIGURE 18 PEKKA THE BAMBI SWINGER

I also familiarized myself with the school's playground. The garden swing where multiple children can swing together was moved from the old school yard when the school's location changed. It is very popular among the students. Most of the blind children sit there during recess. Some able-bodied kindergarten children sharing the same yard sometimes assist them by swinging the swing. The children's assistant also sits in the swing. The children needed assistance at all times. Two of the blind children were capable of swinging independently. An older blind student was able to use the slide since she had learned how to move there and had made a mental map of the equipment. The schoolyard had different surface materials signaling the different areas.

5.3.3 THIRD WORKSHOP, CHILDREN WITH RESTRICTED MOBILITY — RUSKEASUO SCHOOL

The workshop had ten participants who were seven to thirteen years old. Nine participants were girls and one was a boy. The participants were chosen on the grounds that they could model with their hands and share their playground experiences. Two of the participants used wheelchairs and three used walking aids, the other participants did not have clear physical limitations. One participant could not speak so she used a speaking device to communicate her thoughts.

1. EXPERIENCES AND DREAMS TASK

At present almost all the children enjoyed swinging and sliding at playgrounds. Other activities that the children liked were trampolines, carousels, climbers, hammocks, sandboxes, swimming, riding

bicycles, hanging around, climbing, seesaws and riding a sled. A few mentioned high speed, and one preferred small and not steep slides whereas one enjoyed club activity arranged at her nearby playground. One girl using a wheelchair had trouble relating to a playground. It was long ago since she last visited one. Outside she enjoyed talking to her friends.

The most disliked thing at playgrounds was bullying. Four children mentioned being bullied at the playground. The children also did not like being asked about their disability. One girl stated that disabled children are poorly taken into account at playgrounds i.e. it is difficult to climb the stairs up to a slide. Other disliked things were yelling, swearing, litter, too big or steep slides – too high speed that makes you fall off, too many people and crying babies. One girl had experienced that there is nothing to do at a playground in a wheelchair. She would like to go to a playground with friends but she goes there rarely if at all.

The children described a dream playground as one where there would be a lot of different kinds of swings, flowers and a swimming pool. One child wanted an amusement park like playground with a small rollercoaster, a lot of colors, imaginative things and décor i.e. candy or fairytale theme. Others wished for things such as a camel, sand toys, a carousel, a bouncing castle, jump ropes, a sand box, friends, animals, big climbing walls, and a kiosk where you get free sweets and food, you can ride horses and chit chat. One wanted to ride a unicorn with three horns and his dream playground would be a cloud castle made from marshmallows. A few children wished for a playground with easier equipment for disabled children, an accessible playground with not too steep or too low slides, more ancillaries, instructors who help and swimming aids. One child suggested that there could be a playground for only disabled children.

2. WHAT WOULD YOU ADD TO THIS PICTURE TO MAKE IT YOUR DREAM PLAYGROUND?

The idea board collected suggestions such as sausage and nest swings, a play hut, slides, a bouncy castle, a carousel, a café, animals, a roller coaster and a swimming pool.

"Mulla on kurjaa, että kun menee ulos niin mulla on vamma sitte jos joku kysyy, että miksi sulla on vamma. Tai sit kun mä oon kertonu ni sit se voi haukkua ja tai toinen jos joku ei oo nähny dallaria ja kysyy, miks mulla on tollanen ja sit on vaikee sanoa."

I feel miserable when I go out and I have a disability and if someone asks why I have a disability. Or when I tell him/her, then he/she can call me names and if someone has not seen a walking aid and asks why I have one and it's difficult to say. Girl 12 years

"Mulla ei oo mitään uteliaisuutta vastaan, mutta se, että niillä on niin hurjat ennakkoluulot. Ne käyttää sitä hyväksi, kun vammasia on aina helpompi ottaa uhriksi, kun niitä joilla ei oo vammaa. Vammaisten huomioiminen on kuusesta, kyllä, esimerkiksi meillä on sellaiset liukumäet et esimerkiks sinne on tosi vaikee kiivetä, jos on huono kunto. Esimerkiks siin ei oo mitään kaiteita, ne on tosi jyrkät ja tikasmaiset ja yleensä ne leikkivälineet on suunniteltu niinku ketterille ja tollee ei sillee, et niille jolla olis liikuntavamma, joka ei pysty vääntäytyy eri asentoihin ja sitten vaikea mennä esim. liukumäkeen ja kiusaaminen, mulla on kokemusta."

I don't have anything against curiosity, but the fact that they have such a strong prejudice. They take advantage of the fact that it is always easier to pick a disabled person as a victim, rather than one who does not have a disability. Taking disabled people into consideration sucks, for example the slides we have are really difficult to climb up to if you are in a bad condition. For example it does not have any handrails, it is really steep and ladder-like, and generally play equipment is designed for agile children, not for those with a physical disability who cannot twist themselves into different positions and then it is difficult to go to a slide for example - and bullying, I have experienced it. Girl 12 years

3. MOULD YOUR DREAM PLAYGROUND EQUIPMENT

Three children designed swimming pools one of which was a Jacuzzi. Three children designed swings, a nest swing, baby swing and a sausage swing. One designed a snowman and one made a bouncy castle. One child designed a rollercoaster, one made a slide with good handrails and one made a worm train on a track.

One reason why so many children designed swimming pools might be that many of them take water therapy lessons in school and water is a familiar and enjoyable element for them. The gym teacher also said that most of the school children do not use the school playground since they have low rolling force and they are not able to roll their wheelchairs if there is even a slight acclivity. Many children lack outdoor experiences due to the fact that moving around is so difficult. Many of the children rarely visit playgrounds or even outdoors. Outside school time the children stay mainly at home, for example some children stay indoors at home for the whole Christmas break.

FIGURE 20 SLIDE WITH GOOD HANDRAILS

5.3.4 CONCLUSION OF THE WORKSHOPS

VON HIPPEL´S (1986) notion that all people including children are strongly constrained by their real-world experiences and it is difficult for them to think out of the box was confirmed in the workshops. Most of the play equipment the children designed were variations of existing playground equipment such as swings and slides. There were a few novel ideas in the context of a playground such as the popping fox box, where a fox springs out of the box surprising the passer by and play equipment that makes sounds indicating what they are. The play equipment ideas of the able-bodied children and the physically restricted children were similar with the distinction that some of the play equipment the physically restricted children proposed had improved accessible features such as steady handrails. Children's world is very concrete, all of the ideas represented tangible things such as castles, bambis or themes such as candyland or snail world. Imaginative play springs from these tangible objects.

The most beneficial task was the first one where the children shared their experiences and challenges at existing playgrounds. The playground experiences of able-bodied children and physically disabled children differed somewhat from each other. All of the children enjoyed similar things at the playground: swinging, sliding and being with friends. The able-bodied children said that litter and small children occupying the equipment are the things they do not like at playgrounds. Physically disabled children had experienced bullying at playgrounds and equipment that was difficult to use. The children who had faced equipment that was difficult to use were very frustrated with the designs of the equipment and felt that they were designed for able-bodied children not for them. They proposed similar equipment adjusted to their needs and pointed out that very small alterations were needed to make them easier to use. When a child has difficulties in using play equipment, the equipment underlines the weakened ability of a child to perform a certain action which makes the child stand out from others and exposes them to bullying.

The two blind children faced the most extreme needs. Due to the boy's tendency to break his bones he was permitted to swing and he was too big for his favorite bambi swing. He proposed a baby swing where he would fit as a solution to his need. He would

benefit from a swing that supports him and prevents him from falling, so he proposed an existing piece of equipment, baby swing, made his size. The children also needed an assistant to help them at the playground because they could not see where the equipment is and if they are in use. A visually impaired parent reported similar needs in the questionnaire. The parent had difficulties in guiding her visually impaired child at the playground due to the fact that the swinging and riding areas are not confined from the other play areas. She also found it difficult to tell her child whether the slide is free of other children. The parent requested that sound identification could be used to express the boundaries of different equipment. The children's idea that the play equipment would make a sound that indicates their function or shape (slide-swooshing and duck-kvacking) was novel. It would help them not only to detect where the different equipment are located but to identify the different equipment. Sound signals on play equipment would increase the safety of the playground and could enable more independent moving around for the children. These features would benefit able-bodied children as well and could also be a motivating factor for play.

The participants in the Ruskeasuo school workshop were physically disabled children. They represent the middle part of the user pyramid except the child in a wheelchair. Most of the children had reduced strength and mobility and used some kind of aids such as walkers. The needs the children faced at the playground could be filled with slight alterations to existing equipment, and were not so severe that they would have resulted in completely novel solutions. The participants in the workshop at the Swedish school for Visually Impaired can be considered as being at the top of the user pyramid. They were blind and had communicational difficulties and they were dependent on the help of their assistant. Their needs opened up new perspectives at the playground. The need for solutions that support other senses as well as eyesight were highlighted. The child using a wheelchair could not name any needs at the playground since she could not recall being at a playground.

5.4 ANALYSIS OF USING A BLOG

THE BLOG WAS started in February 2012 and updated until June. During the five-month period the blog got four signed in followers from which two were not my friends. 33 people in Facebook from which seven people new to me liked the blog page. Most of the people following the blog or liking it on Facebook were working in the area of playgrounds and were professionally interested in the subject. This included a landscape architect form Australia who commented my blog post and looked forward to following the blog. Contrary to what I expected the blog did not get followers from parents with disabled children. During the five months the blog was viewed 2178 times, approximately 18 times a day. The blog posts received nine comments in total from which three were from parents with disabled children commenting on some products from their point of view.

I expected it to be simple to gain readers for a blog and people to be interested in actively commenting on different posts. Starting and maintaining the blog took a lot of effort. I made new posts at least twice a week in the beginning to get more content on the blog. I takes a lot of effort to market a blog and also to catch the readers and commentators useful to the cause. Getting useful comments requires a large follower base since only a marginal number of the blog readers comment. The benefit of having a blog is that it can be viewed globally and at least in theory it enables comments and best practices from all over the world. A majority of the readers were from North America and Finland. The blog was also viewed frequently in Great Britain and Russia.

From this experience it became clear that putting up a blog for gaining insight and inspiration for the idea generation and concept creation phase of a design process is not very efficient. It is difficult to engage people and get active participators and commentators. The blog worked more as an online idea board where I posted interesting products and collected fun ideas. Having the blog made me look for new ideas and inspiration as well as interesting phenomena around the subject more thoroughly. In the end, when I started designing the concepts I had a lot of ideas and material to choose from and to build upon.

5.5 ANALYSIS OF THE DESIGN CHALLENGE

MANY OF THE problems concerning accessibility in playgrounds are caused by factors other than the actual play equipment. The surface material and positioning of the equipment play an important role in the accessibility of the playground. Play equipment can be made accessible by providing an even surface and accessible paths to the equipment. Even though the equipment can be made reachable it might not be playable if it does not offer any play opportunities at suitable levels.

The challenges physically disabled children face are both physical and social. Playgrounds cannot be entered into, moved around at and playground equipment cannot be played with. Mostly all physically disabled children find some activities that they are able to do in existing playgrounds at present, but in worst cases some children are completely left out from the playground since they are not offered any possibilities for play or participation that would meet their needs and abilities. Playgrounds and play equipment that do not offer diverse challenges and activities at different heights for a variety of abilities are socially excluding – children are prevented from participating in the social experience of play.

All children are engaged in play and enjoy sliding, swinging and spinning to some extent, but due to ill-designed equipment all children are not able to play, as they would like to at present. Play equipment should reinforce the capabilities of children rather than underline disability. Solving the challenges that physically disabled children face at playgrounds due to the lack of accessibility and social inclusion can result in safer and more diverse playgrounds for able-bodied children as well. A playground that allows the participation of children with a diverse range of abilities provides a social learning environment for all, contributing tolerance and helping to understand difference.

The biggest challenges at playgrounds are the lack of shade, color contrasts and clear boundaries between equipment, inaccessible surface material, uneven surfaces and low obstacles, too steep steps and slides, play equipment that does not enable an assistant to aid the child, lack of handrails, swings hanging from the same height and a lack of swings with backrest, a lack of exercises at medium and low level and a lack of possibility to perform activities

in an ergonomic position. Untidiness and litter also created hazards and inconvenience. Both the parents of special need children and the children themselves reported that the children were sorry they did not fit into play equipment meant for small children anymore. Handrails support both visually impaired children and children with difficulties in walking and keeping balance.

According to my research the play equipment should provide a variety of play opportunities at different levels, the exercises should be able to be completed in a good ergonomic position, they should support a range of physical challenges, have good color contrasts, take assistants into account, motivate children to move and promote interaction. The play equipment should also enable good visual contact between the child and the parent or assistant. The playground should also offer accessible support facilities for parents and children such as benches, picnic tables, shelters and garbage cans.

The task of designing more accessible and playable playground equipment is not only a question of meeting the needs of a small segregated group of children and adults and enabling their access to play. Inclusiveness and creating an equal environment for all are fundamental values that underlie good design.

FIGURE 21 EXAMPLES OF STIGMATIZING EQUIPMEN, SWING

FIGURE 22 SANDTABLE

STIGMATIZING SPECIAL EQUIPMENT

SANDTABLE INDICATING THAT PHYSICALLY RESTRICTED CHILDREN DO NOT BELONG TO THE CENTER OF PLAY

6 GENERATING THE CONCEPT

6.1 DEFINING THE DESIGN CHALLENGE

THE PHYSICALLY DISABLED children's experiences of playgrounds and the harmful challenges they encounter there form the reference point for the product development. The research process highlighted the need for a change of perspective from focusing on disability to designing for abilities. Therefore, my goal is to design accessible and playable playground equipment that supports different abilities and suit the needs of as many children as possible. The parents' questionnaire as well as the co-design workshops also revealed the need for equipment that allows certain activities to be carried out more flexibly, such as a bigger swing with a backrest. The play equipment should offer various affordances for different activities. The challenge is how to promote and enable different levels of ability. Another challenge is to validate the design with the participants of the co-design workshops. Do the children find the designs appealing and playable? The design should appeal to and enable the creative play of both able-bodied and physically restricted children. The design should appeal to and be able to be used by children from five to twelve years old. The participants in the co-design workshops were six to thirteen years old.

6.2 DESIGN DRIVERS

Designing playground equipment that suits disabled children as well as non-disabled children. Not designing stigmatizing special equipment that underlines the disabilities and impairment of the child. Focusing on social inclusion as well as the possibility to use

WHAT CAN A DISABLED CHILD DO AT A PLAYGORUND?

LITERATURE REVIEW

QUESTIONNAIRE FOR PARENTS

EVALUATION WORKSHOP

BLOG

EXPERT INTERVIEW

CONCEPT

EVALUATION

CO-DESIGN WORKSHOPS

PLAYGROUND RESEARCH

DESIGN DRIVERS

EMPATHIZING   DEFINING   IDEATING   CONCEPT   TESTING
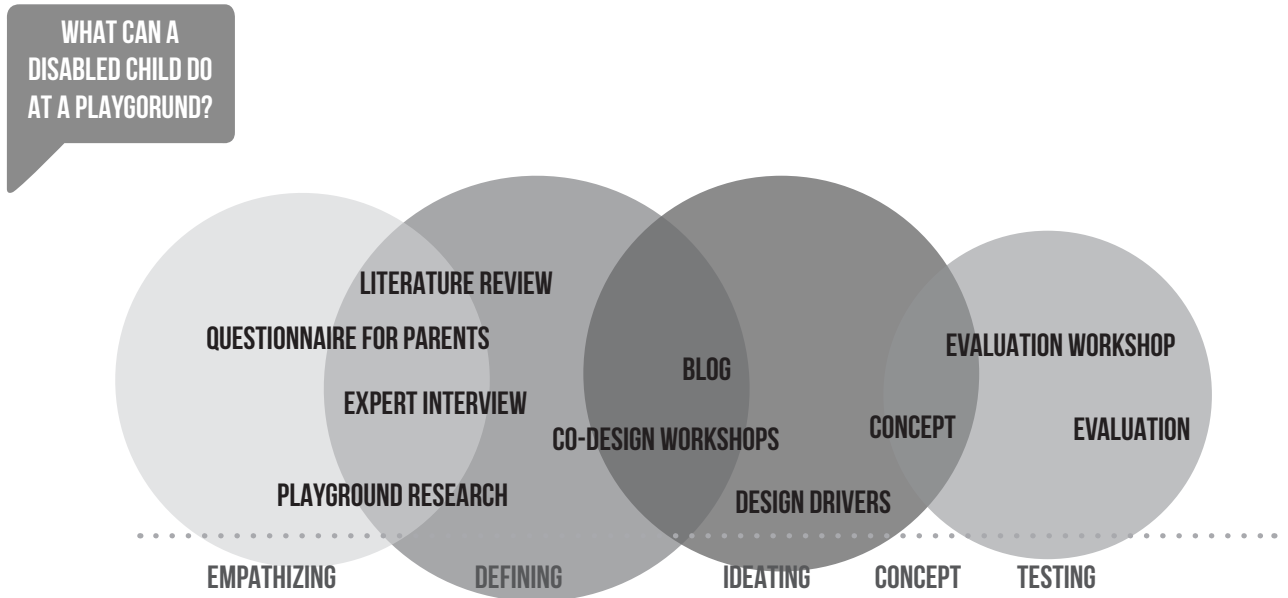
the equipment. Seven principles that are essential for the design of accessible play equipment arose from the research. These principles guide the design process.

FIGURE 23 THE DESIGN PROCESS

1. TAKE AN ASSISTANT INTO ACCOUNT (PARENT/ASSISTANT CAN SUPPORT CHILD OR AID CHILD THROUGH THE EQUIPMENT)

2. MOTIVATE TO PLAY

3. PLAY OPPORTUNITIES AT DIFFERENT HEIGHT LEVELS

4. CLEARLY COLORED EQUIPMENT AND USE OF ADEQUATE COLOR CONTRASTS

5. ENABLES ERGONOMIC POSITION

6. ENABLES DIFFERENT LEVELS OF PARTICIPATION (ACTIVE DOER, ONLOOKER ETC.)

7. SUPPORTS DIFFERENT ABILITY LEVELS AND REINFORCES CAPABILITIES

DESIGNING PLAYGROUND EQUIPMENT THAT SUITS DISABLED CHILDREN AS WELL AS NON-DISABLED CHILDREN

FOCUSING ON SOCIAL INCLUSION AND PROMOTING ABILITY

NOT DESIGNING STIGMATIZING SPECIAL EQUIPMENT THAT UNDERLINES THE DISABILITIES AND IMPAIRMENT OF THE CHILD

ALL CHILDREN SHOULD BE OFFERED ACCESS TO THE SOCIAL EXPERIENCE OF PLAY	ABILITY-BASED DESIGN FOCUSES ON WHAT CHILDREN CAN DO AND HOW TO SUPPORT THAT ABILITY	CHILDREN ARE CONSTANTLY DEPENDENT ON THE HELP OF AN ADULT
THE CHALLENGES THAT CHILDREN WITH RESTRICTED MOBILITY OR VISUAL IMPAIRMENT FACE CAN BE UNIVERSALIZED TO ALL CHILDREN TO SOME EXTENT.	ACCORDING TO CHILDREN THE MOST IMPORTANT FUNCTION OF THE PLAYGROUND IS TO OFFER SOCIAL INTERACTION WITH PEERS.	ALL CHILDREN SHOULD BE ALLOWED TO USE THE PLAY EQUIPMENT INDEPENDENTLY AND ON EQUAL TERMS.
THE PARENTS OF ABLEBODIED CHILDREN CAN ALSO HAVE PHYSICAL OR VISUAL IMPAIRMENTS	DESIGNING SOLUTIONS THAT SUPPORT THE FULL RANGE OF HUMAN POTENTIAL.	PLAY EQUIPMENT SHOULD REINFORCE THE CAPABILITIES OF CHILDREN RATHER THAN UNDERLINE DISABILITY.

FIGURE 24 THE FINDINGS FROM THE RESEARCH THAT FORM THE DESIGN DRIVERS

6.3 IDEATION — CONCEPTS

6.3.1 FIRST CONCEPT

THE FIRST CONCEPT was inspired by the most accessible piece of equipment in the market – the nest swing, loved by all regardless of their abilities. The concept is based on rope, which is a soft, more haptic material that enables creating a coherent and novel look for playground equipment distinguishable from the glaringly colored equipment on the market.

FIGURE 25 NEST SWING

"köysimetsä"

"ROPE FOREST"

FIGURE 26 INSPIRATION BOARD

'nallekeinu'

'TEDDY SWING'

A big swing with a backrest.

"kukka karuselli"

'FLOWER CAROUSEL'

A roundabout spun by hands, with a backrest
enabling an ergonomic spinning position.

'pyörivä kukka'

'ROTATING FLOWER'

A solo carousel spun by feet or by assistant.

"Kaverikeinu"

'FRIEND SWINGER'

A swing where you can swing sideways with a friend
or a parent can hold a child in his/her lap and swing.

"joutsen tunnel."

'SWAN TUNNEL'
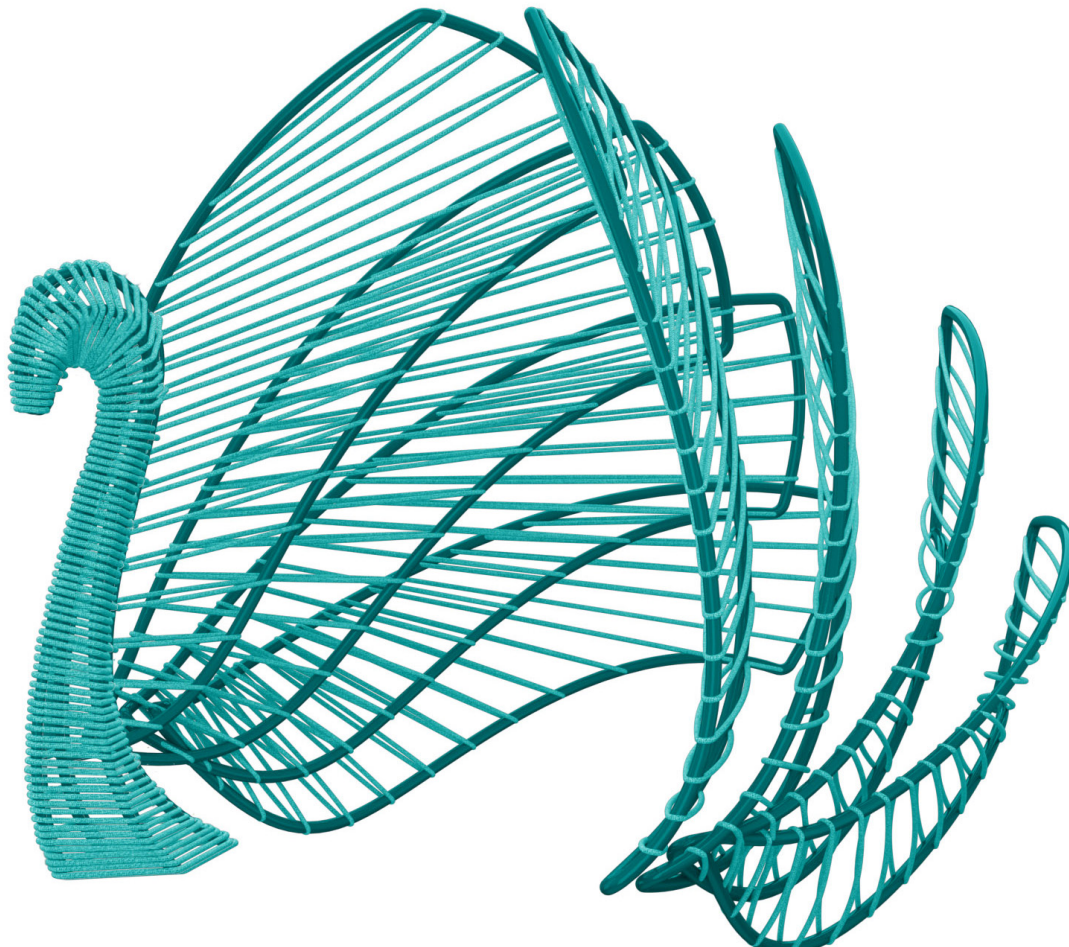
A tunnel that you can run through or pass through with a wheelchair

"Karhun pesä"

'BEAR DEN'
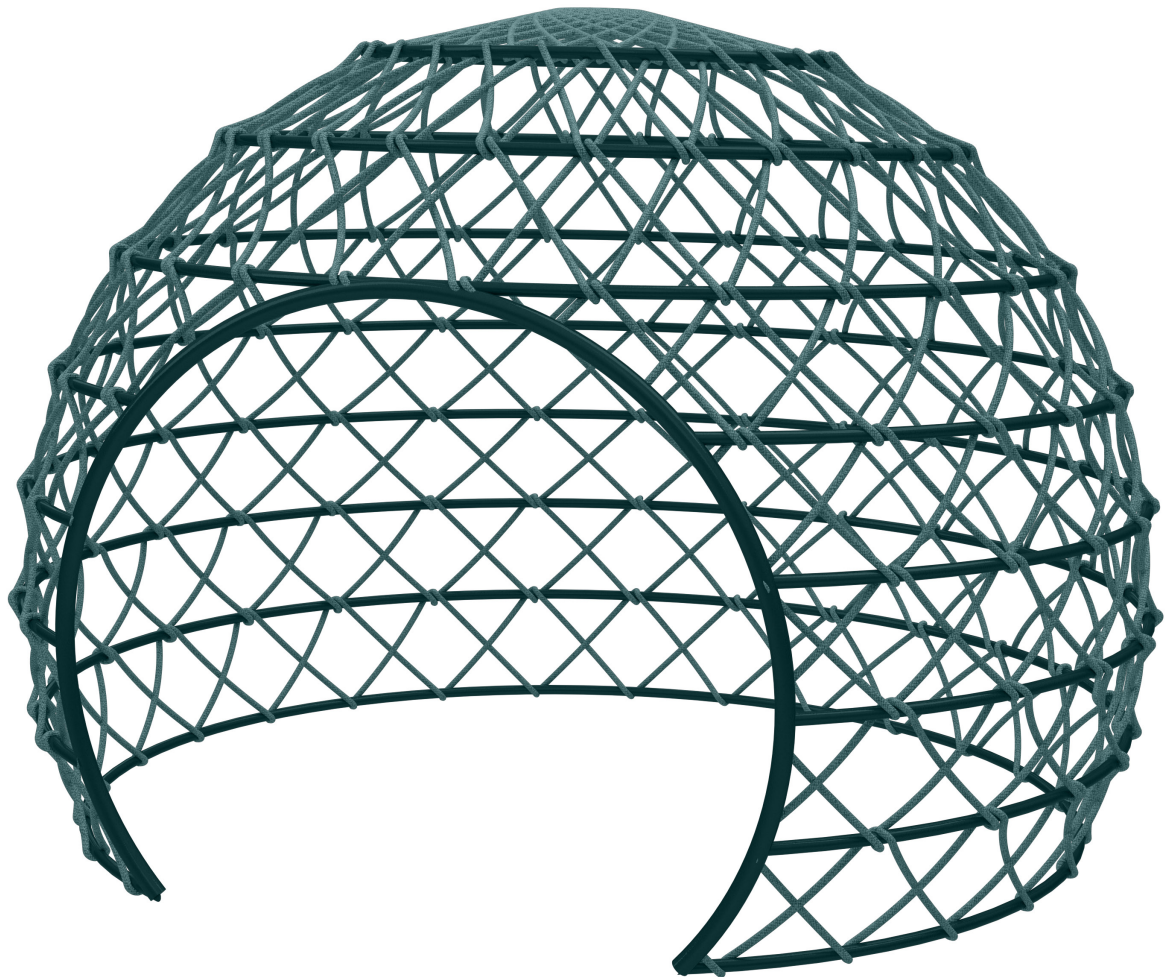
A play hut

"hiekkalaatikko"

'SAND BOX'

An elevated sand box providing a possibility to sit in the sand box, or to use it as a sand table by sitting on a bench in an ergonomic position or in a wheelchair.

¨liukumäki¨

'SLIDE'
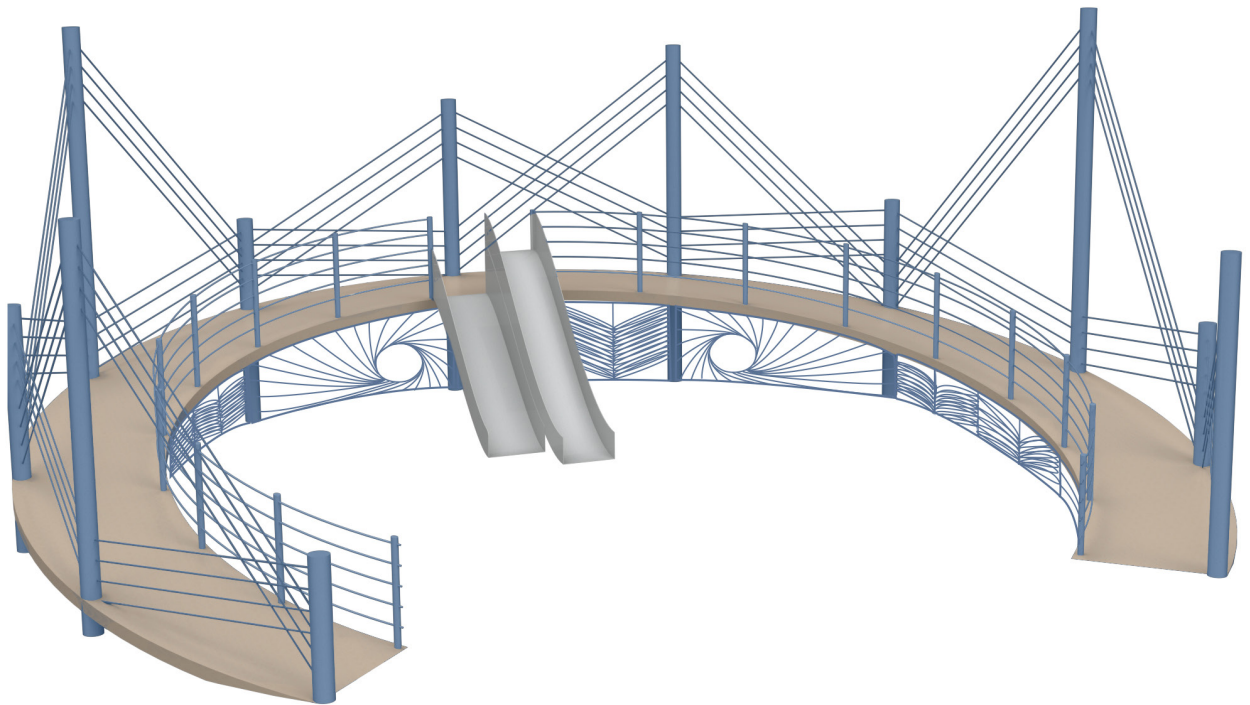
The slide has two different levels and sound identification. The elevated slide can be mounted onto from a wheelchair.

6.3.2 SECOND CONCEPT

THE SECOND CONCEPT was inspired by Nordic wood design. The challenge was to apply the functions of the first concept to a different material, preferably wood. My aim was to create a novel look for wooden play equipment that clearly differentiates it from the dull and unimaginative world of play equipment made from panels.
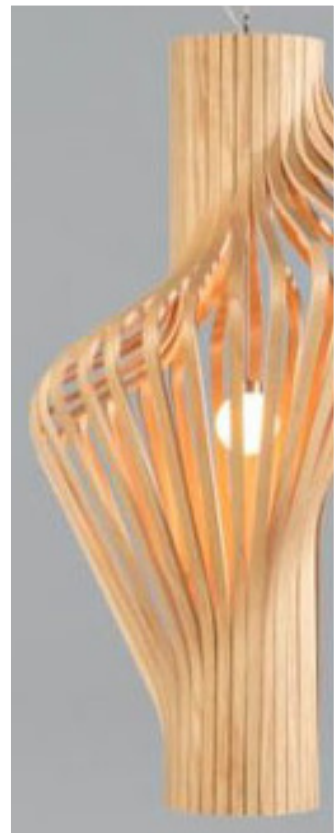
PLAYTALENT

kaverikeinu

FRIEND SWING

kukkakaruselli

FLOWER CAROUSEL
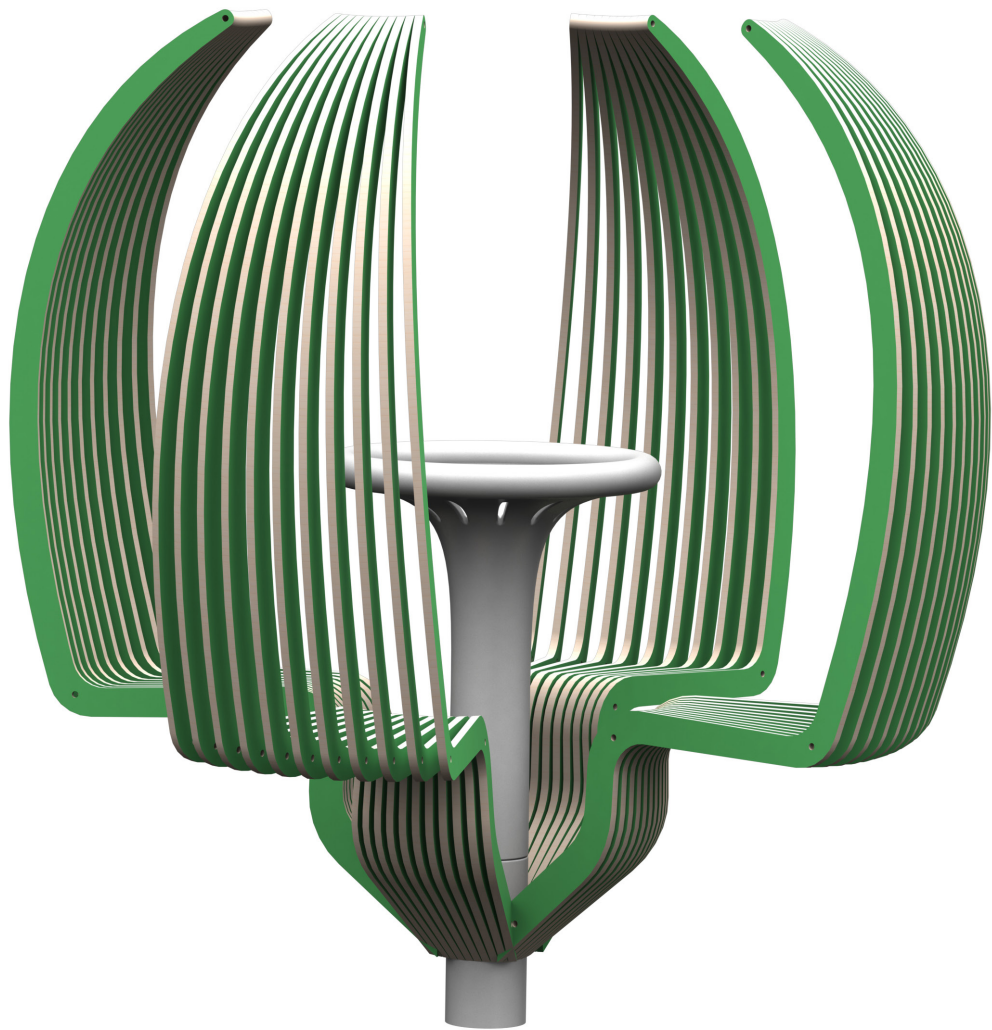
hyrrä

SPINNING TOP

polkukaruselli

PEDAL ROUNDABOUT
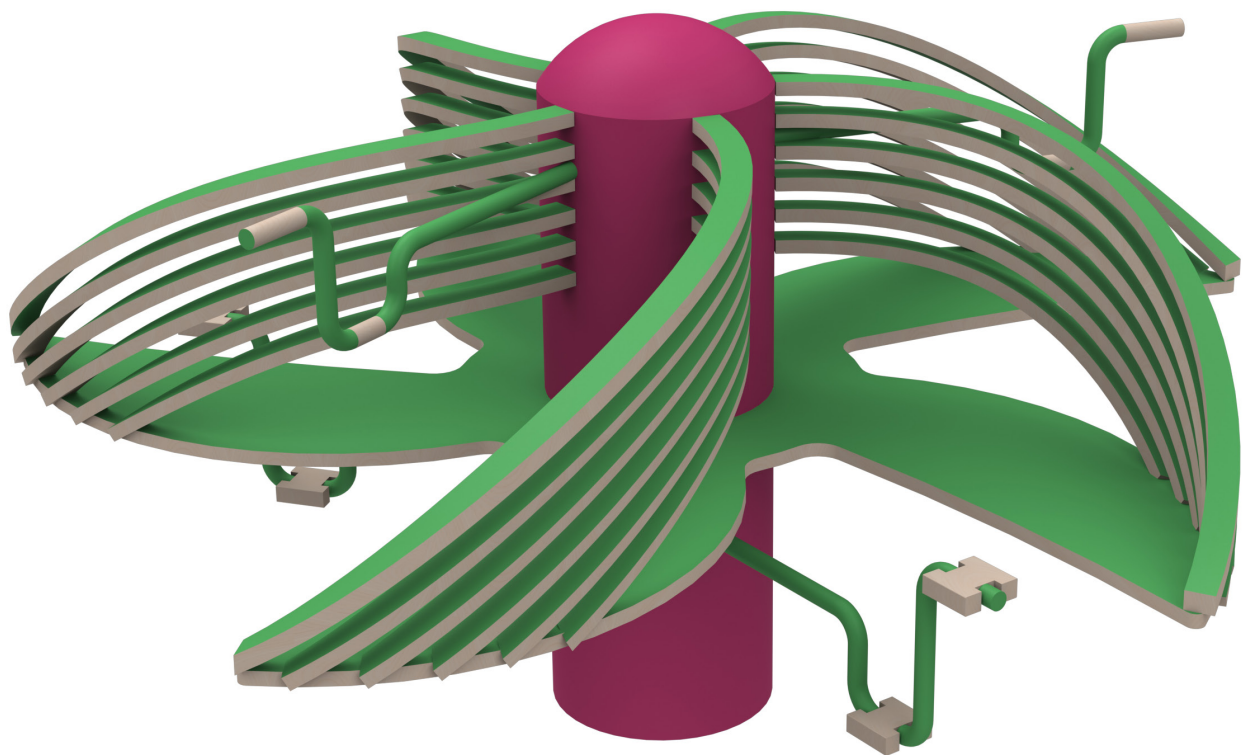
siipikeinu

WING SWING

6.3.3 THE FINAL CONCEPT

AFTER EXPLORING AN alternative material I went back to rope because I felt it offered more possibilities and is a softer material. Rope that glows in the dark could also be tested. I wanted to make the concept more cohesive and take the idea of sound identification further. I was touched by the experiences of the disabled children and wanted to address the issue of social inclusion. The teddy swing was one of the very first ideas I had for a bigger swing with a backrest. After witnessing a grandma imply her granddaughter that she should not swing in a big plastic swing with a backrest since it was meant for disabled children I really wanted to design a swing that would not be stigmatizing and look like it is "meant for the disabled". I found the idea of swinging in the lap of a bear inviting. I questioned whether the equipment should be concrete or abstract and came to the conclusion that according to the different research the children wished for recognizable things. I decided to redesign the equipment in the first concept as animals to form a set of equipment that belong together. The different animal characters were chosen so that they fit the functions of the equipment. The characters are friends with each other and even if a child would have no one to play with at the playground they can always find an animal buddy there to play with.

Giving the play equipment the shape of different animals also enabled giving them a distinct sound. I addressed the idea of sound identification so that the animals would have their own recognizable sound that could be heard for example when the equipment is in use. I redesigned the equipment to look like the animals and drew the animal characters. I named the animals Ti, Re Fa and Do according to different notes so that the sounds the animals make would be at different heights according to the musical scale. I gave the animals different characteristics to make them more recognizable. Ti the bear is giggly, Re the monkey is jumpy, Fa the cat is shy and Do the turtle is dizzy. Having both the recognizable equipment and the drawn characters expands the possibilities of using the characters in other solutions and formats such as applications and games. For example a playground application could be developed that would track the child's activities and visualize used routes at the playground. The characters could invite the child to play if it were long since the last visit to the playground.

The different functions of the equipment are chosen on the basis of supporting different abilities: able to use upper limbs, able to use lower limbs. The swing is designed so that it could be used with minimum ability to support oneself. It can be used by anyone with the ability to lean, sit, or sway. A seat belt can be added so that it prevents from falling and an assistant can sway the swing. The turtle can be spun by feet or by an assistant. The minimum required ability to use the friend swing is the ability to lie. The swing can be used by alone or together with a friend or by sitting or lying in the lap of an assistant. The flower carousel is spun by hands and has a backrest enabling an ergonomic position. Seat belts can be added so that a user can participate by sitting and spinning along while an assistant spins the carousel. The bear den can be climbed on and rolled in. The sand box can be used in a wheelchair or sitting in an ergonomic position or by sitting in the sand inside the box.

Do and Co

TI	RE	FA	DO
THE BEAR	THE MONKEY	THE CAT	THE TURTLE
-GIGGLY-	-JUMPY-	-SHY-	-DIZZY-

TI

THE BEAR
SWING
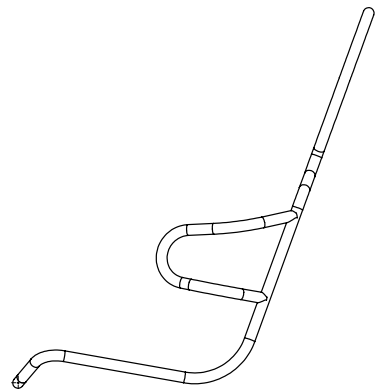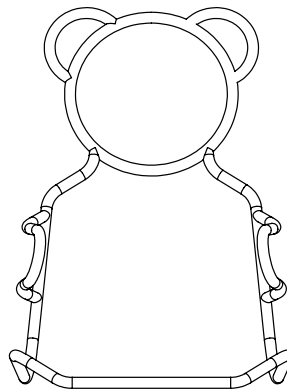
RE & FA

THE FRIEND SWING
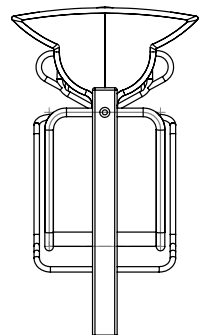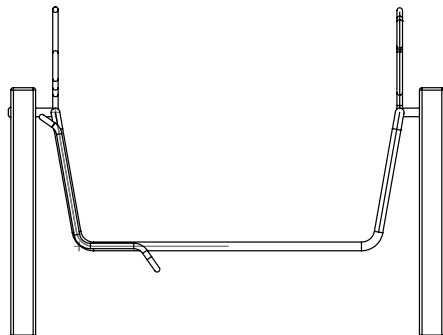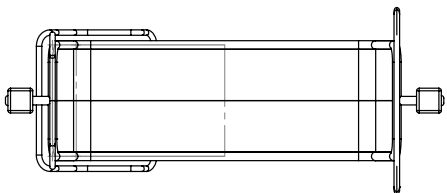
DO

THE TURTLE
SPINNER
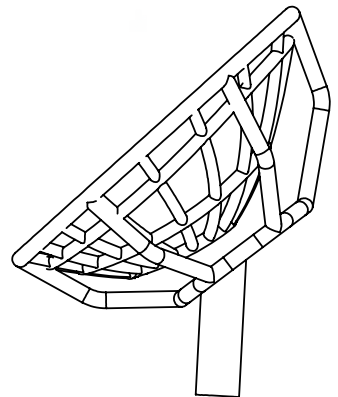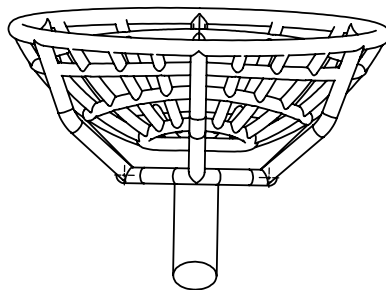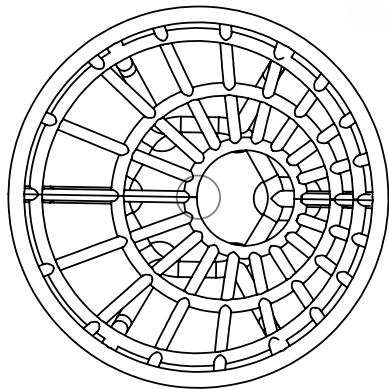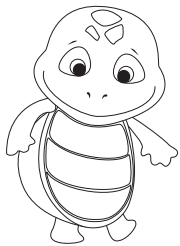
WE-E

THE FLOWER CAROUSEL
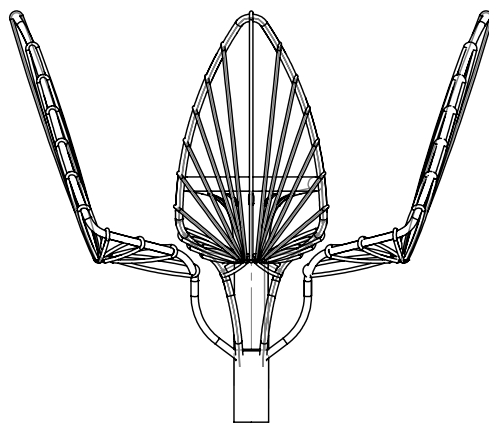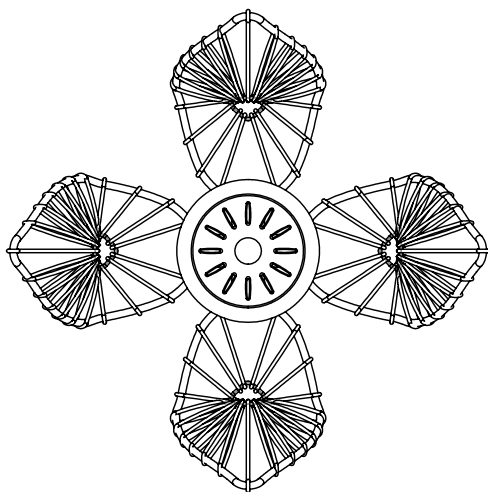
DEN
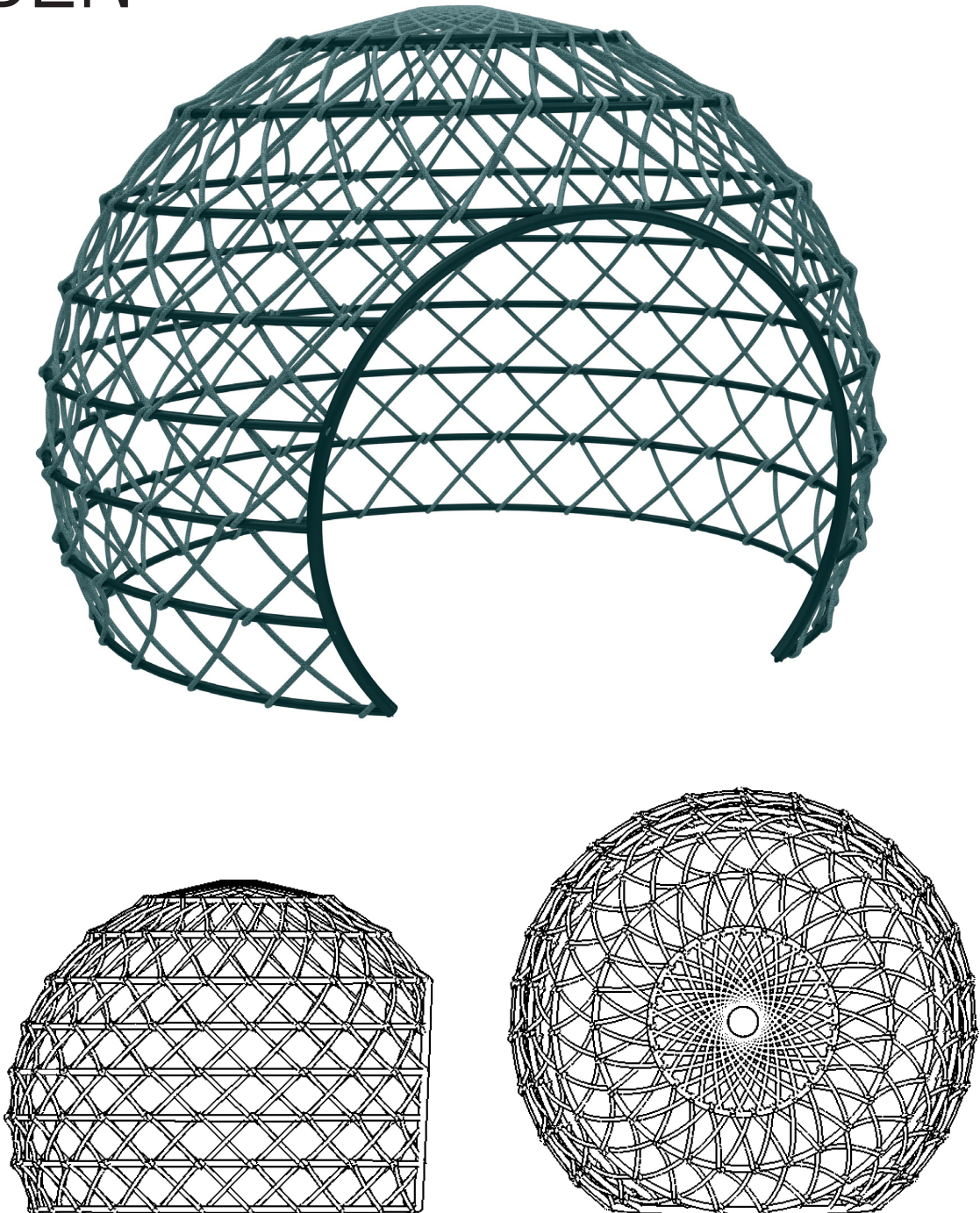
SAND BOX
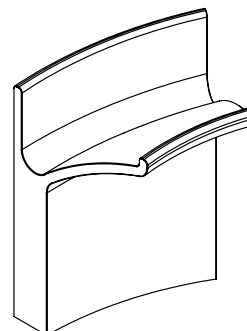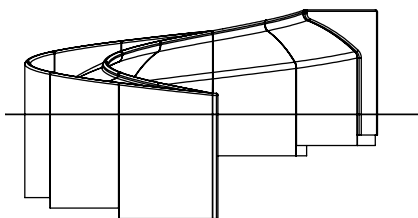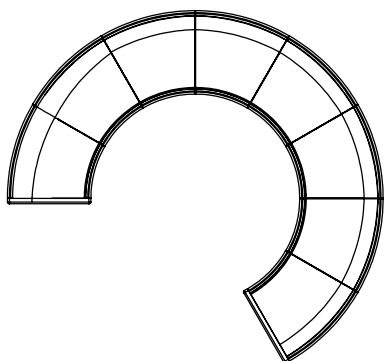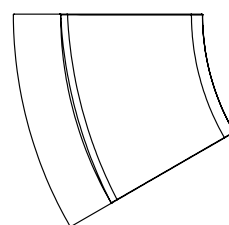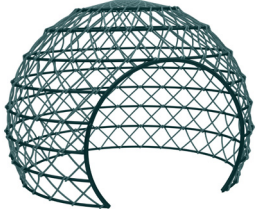
I CAN...	BODY PART	ACTION
LEAN SIT SWAY		SWINGING
SIT LIE REST ROCK		SWINGING, SITTING BEING PRESENT
KICK HOLD ON		SPINNING
SIT ROTATE WITH MY HANDS		SPINNING
SIT STAND OBSERVE CLIMB		HIDING IMAGINARY PLAY OBSERVING CLIMBING

FIGURE 28 ABILITY CHART ILLUSTRATING
THE MINIMUM ABILITY LEVEL REQUIRED TO
USE THE EGUIPMENT

GAME
APPLICATION

FIGURE 29 EXAMPLES OF WHAT THE GAME
APPLICATION COULD BE LIKE

6.4 EVALUATING THE CONCEPT

6.4.1 EVALUATION WORKSHOP, CHILDREN WITH RESTRICTED MOBILITY — RUSKEASUO SCHOOL

THE WORKSHOP HAD eight participants who were eight to eleven years old. Six participants were boys and two were girls. Three of the participants used wheelchairs and three used walking aids, the other participants did not have clear physical limitations. One participant could not speak and communicated through picture cards and a speaking device. Two of the participants had participated in the co-design workshop held at the school earlier.

1. WHICH DESCRIBES THE PLAYGROUND EQUIPMENT BEST? CIRCLE.
JEY! I WANT TO TRY! ORDINARY WONDERFUL ANIMALS BORING FUN CHILDISH OKAY I CAN!

Most of the children circled more than one description. I want to try! was circled five times, Jey! was circled twice, Wonderful animals twice and Fun! and Okey twice.

2. DESCRIBE THE PLAY EQUIPMENT IN YOUR OWN WORDS. WHAT'S GOOD AND WHAT'S BAD?
Friend swing: Three participants wrote that it is nice to swing with a friend. One wrote that it is nice to be able to be with a friend and chat together. One was concerned whether you can fall off easily.
Teddy swing: It is nice to be in the teddy's lap. Soft teddy. Belt is missing.

Bear den: Can be quite boring. It is romantic; a secret place where you can eat packed lunch. I can go in; Jey! I can fit in with my wheelchair together with my friends.

Flower swinger: Many friends can play together. It would be nice to try. It is nice to be face to face. It needs a belt to be safe in fast speed.

Turtle spinner: It is good because it spins. Belt is missing. You can faint in it; I like it.

Sand box: It is good that it is big. It is good that you can fit with a wheelchair. Many children fit to play. There could be a slide in the middle.

3. WHICH PIECE OF EQUIPMENT DO YOU LIKE MOST? WHY?

All of the equipment was liked. No single favorite stood out. Two liked the teddy swing, because you could swing fast speed. Two liked the turtle, because it is funny and they like to spin. Two liked the flower carousel most because spinning makes them laugh. One liked all of the equipment. One chose the nest and the sandbox because she can go in the nest with a wheelchair and play at the sandbox in the wheelchair. She also liked that she could be there in peace and quiet.

"Mä tykkään ihan kaikesta, kun ne on niin hauskoja."

I like everything, because they are so fun. Boy 9 years.

"Karhunpesä on niin hauska, kun siinä saa lämmitellä ja nukkua."

The bear den is so much fun because you can warm up and sleep in it. Boy 9 years.

6.4.2 EVALUATION WORKSHOP – LAAJALAHTI PRIMARY SCHOOL

THE WORKSHOP HAD seventeen participants who were nine to ten years old. Seven participants were boys and ten were girls. The children were engaged by the animation and laughed as the different characters emerged.

1. WHICH DESCRIBES THE PLAYGROUND EQUIPMENT BEST? CIRCLE.
JEY! I WANT TO TRY! ORDINARY WONDERFUL ANIMALS BORING FUN CHILDISH OKAY I CAN!

Eight children circled I want to try! Three children circled Okey and two circled Fun. Jey! was circled three times.

2. DESCRIBE THE PLAY EQUIPMENT IN YOUR OWN WORDS. WHAT'S GOOD AND WHAT'S BAD?
Friend swing: Six children wrote that it is nice and it's nice to swing

with a friend. Two children found the friend swing dull. Seven children liked the swing but were worried that you might fall off, four of them suggested that a handrail or railings would be added. Teddy swing: Five children found the swing cute. Two children thought that it is not very interesting. Four children thought that the backrest is good, but two of them reckoned that it might make swinging more difficult. One child thought that it is nice that it makes a sound whereas two children found it disturbing that the swing makes a giggly noise.

Bear den: Nine children liked the bear den and the fact that you can climb on it as well. Two children were concerned that your leg might get caught and break. Two children were very excited that you could climb inside the bear den and hang from the ceiling. One child stated that she likes it very much and would want one in her garden and plants could grow on it. She wrote: What a hut!

Flower swinger: Three children liked that you can swing together with friends. Two children liked the shape of the flower swinger. Six children found the swinger interesting and fun. Two children wrote that it is perfect. One was happy that it had a backrest to prevent from falling and felt that it is safe.

Turtle spinner: Eight children thought that it was a nice idea and looked fun. One wrote that it is great that is big enough to enable a good spin. Three children thought that is nice that you can spin and two were concerned that you can feel sick if you spin too much.

Sand box: Ten children found the sandbox good for playing with sand. Four children found the sand box boring. One child wrote that it is good that the other end of the sand box is higher. One child wrote that it would be wonderful to play chef show when you have a "kitchen table". She would like to add an even surface where you could set the cakes for display.

3. WHICH PIECE OF EQUIPMENT DO YOU LIKE MOST? WHY?

The flower carousel was the most liked piece of equipment. Nine children liked it the most. They liked the way it looks, the fact that it spins and you can use it together with friends. One like it because you can spin it with your hands. Four liked the bear den the most

because you can climb on it and especially because you can climb upside down inside it.

"Mun mieleistä ne kaikki oli aika kivoja ja sitten mun lemppari oli se karhunpesä, kun siellä voi kiipeillä pää alaspäin."

I think all of them are quite nice and my favorite was the bear den, because you can climb upside down. Boy 10 years

"Mä tykkäsin noist kaikista laitteista tosi paljon. Mun lemppari oli kukkakaruselli, koska siinä voi olla kavereitten kanssa ja se on kiva, kun se pyörii."

I liked all of the equipment really much. My favorite was the flower swinger because you can be in it with friends and it is nice that it spins. Girl 10 years

Comments from the answer sheets:

Tykkään tosi paljon! Ihana esim. omalla pihalla, jos siihen kasvaa kasveja kiinni. Mikä maja!

I like them very much! It would be lovely for example in my own yard, if plants would grow on it. What a hut! Girl 10 years.

Karhun pesä on hyvä! Tuolla katossa olisi kiva kiipeillä!

The bear den is good! It would be nice to climb in the roof! Boy 10 years.

Ihana nuo tuolit ja voi ottaa kavereiden kanssa vauhtia. Kun on selkänojat ei voi oikein tippuakaan. Turvallinen.

Lovely chairs and you can spin speed with friends. When you have back rests you can not really fall off. Safe. Girl 10 years.

Miten ihana leikkiä kokkishowta, kun on "keittiön pöytä". Voisi ehkä olla tasaista ja hiekatonta tilaa, johon saisi laitettua kakkuja.

How wonderful to play chef show when you have a "kitchen table". There could be flat space without sand, where you could set cakes. Girl 10 years.

GAME APPLICATION

WHAT DO YOU THINK ABOUT A GAME LIKE THIS? WOULD YOU USE IT? WHAT MORE COULD YOU DO IN THE GAME?

EIGHT CHILDREN FOUND the game application fun. Three thought that it is boring and three did not quite understand it and found it odd. Nine children thought that they would like to play the game. Three children would not like to use it and two were uncertain if they would use it. One child suggested that you could make your own character in the game. One would add more animals such as a dog, wolf and a penguin. One child suggested that the application would cheer you on, someone would shout: "Go on! Go on!" and there would be a chart where you could see who´s the best in the playground. One suggested that you could add more pieces of equipment and you could see your score after each piece of equipment. One child suggested that you could take care of the park and the animals in the game. Making your own profile was suggested, so that you could pick your own animal and it would grow when you move in the playground. You could feed the animal and dress it according to the weather. The game could recognize the other users at the playground and you could visit your friends in the game. One child proposed that the game would record how many meters you had gone at the playground.

"Siinä vois olla sellanen, kun siinä näkis, kun siellä puistossa on liikkunu tosi paljon tyyppejä, ni kuka siel puistossa on liikkunu eniten."

It could show who has moved around the most at the playground. Boy 10 years.

"Jos mä olisin ite tehny sen, mä olisin lisänny sinne eläimii, niinku koiraa, sutta tai pingviiniä."

If I would have done it, I would have added animals there like a dog, wolf or pinguin. Girl 10 years.

"Mun mielest se olis kiva, jos ois enemmän niit eläimiä ja näkis muut siellä puistossa liikkuvat, pystyis tekee niinku oman profiilin ja sais valita, mikä eläin niistä on. Sitä eläintä sais niinku pukee ja se kasvais, mitä enemmän liikkuu."

I think it would be nice if there would be more animals and you could see the others at the playground, you could make your own profile and you could choose which animal you would be. You could dress the animal and it would grow the more you move. Girl 9 years.

6.4.3 CONCLUSION OF THE EVALUATION WORKSHOPS

BOTH THE PHYSICALLY disabled children and the able-bodied children were excited about the play equipment and wanted to try them. None of the children found the equipment childish or clearly labeled as meant for a certain group of children for example for someone in need of extra assistance. All of the children found the functions of the equipment, spinning, swinging etc. fun and engaging. To my surprise children in both groups were concerned about the safety of the equipment and suggested extra handrails especially for the friend swing. All children wanted to try the equipment but pondered their ability to use it safely regardless of which group they belonged to. For example two able-bodied children were concerned that you might get sick if you spin too much in the turtle spinner whereas one physically disabled child was excited that you can spin so hard you can faint in it. The amount of spinning one can take varies between each individual regardless of their other abilities.

The need for social play was highlighted in the children's choices of favorite equipment. Most of the favorite equipment chosen by both groups enabled playing together with friends. It is interesting that a piece of equipment that sprung from the need to create something that could be used and enter into with a wheelchair became a piece that was most exciting among the boys in an ordinary school class. They expanded and developed the ways in which the bear den can be used. The piece of equipment, which was meant to be a place that enables staying still, hiding and observing became the most exciting place to explore. It was fun to see how

the children's imagination gave new functions and meanings to the equipment. The boys saw the bear den as a place to explore and develop their climbing skills whereas for a girl in a wheelchair the bear den represented a romantic, secret place. Overall the equipment was not seen as special equipment meant to enable the play of certain users. For example the sand box was not seen as a sandbox for wheelchair users but an arena for imaginative play in the form of a chef show. The shape of the sandbox enables playing in a wheelchair and also enhances the play experience of able-bodied children.

The game application seemed to be hard to grasp at first. When discussed further the children got excited about the application and found it an interesting addition to the playground. The children had a straightforward approach to combining physical equipment and the game reality. The game was seen as a way to monitor your performance at the playground and to compete and connect with friends. The animal characters started to live their own lives in the game reality. Making your own profile or choosing your own character was suggested so that your actions on the playground would affect and build the character. The characters could be taken care of by dressing them up for the right weather and feeding them in the game and then the game could continue by playing with the physical characters at the playground. The game application was seen as a collateral world that could enhance and add to the actual play experience at the playground.

7 DISCUSSION AND CONCLUSIONS

7.1 EVALUATION OF PROCESS

AS A DESIGNER, I personally find my motivation and inspiration from the real life experiences of end users, the physically disabled children in this case. For me it was essential to learn from their experiences and to empathize with them. Familiarizing myself with research done on the accessibility of playgrounds and hearing the parents' perceptions through the questionnaire helped in building the co-design workshops and working with the children. Through extensive research it became clear that playgrounds and play equipment are mostly designed with able-bodied children in mind, and many of the accessibility problems in existing playgrounds and play equipment require only attention and minor modifications to be overcome. However playground equipment is not designed to support different levels of ability and independent play, and there are only few pieces of equipment available on the market that suit the needs of a wider range of children. The solutions in the final play equipment concept all spring from insights found in the design research and the literature.

As the background research showed it is vital to engage disabled children and their parents in the design process of accessible and playable playgrounds and playground equipment. There are different ways in which they can take part in the process, by sharing experiences, ideating, creating, and evaluating. I chose to use empathic design research methods; co-design workshops, a survey for parents and evaluation workshops to validate the findings of the co-design workshops. It was very beneficial to include both able-bodied and physically disabled children in the research

and to do co-design and evaluation workshops with both groups. Through the process it came clear that the experiences of the physically disabled children and the notions made in the workshops formed the design drivers that guided the actual design process and translated in the end design. The able-bodied children's workshop functioned as a reference point to compare the experiences of the different groups. The evaluation workshop showed that the concept designed to meet the needs of the physically disabled users was well received among the able-bodied children as well and not conceived as designed for 'the disabled'.

Von Hippel's (1986) notion that users capacity to imagine novel products is constrained by their own real-world experience was proved right in the co-design workshops. The ideas and designs that both the able-bodied and the disabled children produced were different versions of existing products, and nothing really novel came up. Hearing the physically disabled children's experiences and wishes for a playground gave the most insights and drivers for the design process. I was quite concerned about how the workshop with visually impaired children would turn out and what the benefits of the workshop would be when I heard that the participants have communication problems in addition to visual impairment. It was a challenge to ideate useful tasks that they would be able to complete, after all my aim was to learn from their personal experiences. At the workshop I found out that both of the participants were completely blind, which is rare, since most visually impaired people have some level of vision. Being completely blind and having communicational problems the two children represented real extreme users and faced the most extreme needs. The children were dependent on an assistant since they could not see the different equipment and whether they are in use. The idea that play equipment would make a sound that indicates their function or shape sprung from the children's need to detect the different equipment. The novel idea of functional sound signals on play equipment would increase the safety of playgrounds, enabling more independent moving around for children and could be a motivating factor for play for all children. In the end I was very content with how the workshop turned out and overall it was a good learning experience for me. The workshop raised the question that can we as designers talk about user-centered design and co-design if we are willing to exclude some users as too difficult and arduous to work with. Are

these users not the ones whose voices are never heard? They in particular might provide valuable insights.

The fact that the most novel and valuable insight for the design process arose in the workshop with the most extreme users indicates that users at the top of the user pyramid can be the most beneficial ones to include in the design process. The needs of the other physically disabled users were not as extreme and could be filled with slight alterations to existing equipment and were not so severe that they would have resulted in completely novel solutions. Even though the other co-design workshop with physically disabled children did not result in completely new ideas it provided valuable insights into the challenges the children face at existing playgrounds.

Physically disabled children can be seen as having a major role in this product development process. Designing for their needs and abilities resulted in finding novel and fresh perspectives on how to design playground equipment. The needs of extraordinary users, physically disabled users in this case, can be considered the same as the needs ordinary users face situationally. The skills, abilities and motivation of children vary regardless of whether they have disabilities or not. Illness can also temporarily affect a child's ability to perform different activities and weaken the child's will and courage to move and play. As the research showed children suffering from rheumatism are good examples of situationally disabled users. Mostly they are capable of moving around freely but at times the pain and state of the illness prevent them from participating in multiple activities and they require lightened exercises.

All children can suffer from situational disability when their capability to perform tasks deteriorates due to environmental or health conditions. As the questionnaire for the parents of physically restricted and visually impaired children showed the challenges that the children with restricted mobility or visual impairment faced can be universalized to all children to some extent. All children can suffer from dazzling sunlight, the lack of shade, uneven surfaces, and low obstacles can cause hazards to all. Most small children require assistance in slides and climbers and the equipment should enable the safe assisting of the child. Both able-bodied children and special needs children can be timid and guarded and need to be motivated to move and explore different play opportunities.

7.2 OUTCOME

THE BACKGROUND RESEARCH showed that there is no need for special playground equipment meant for physically disabled children. Instead it highlighted that there is a need for playground equipment that is useable and playable by children of any age and ability, equipment that gives the opportunity to develop skills independently and supports each child to reach their full potential. The most popular activities at playgrounds have stayed the same – children enjoy swinging, sliding, and spinning the most. The background research showed that children with physical disabilities can not engage in these activities. Children such as those suffering from rheumatism can situationally not play with existing equipment due to the state of their illness.

The design process did not result in unprecedented equipment and completely novel activities. The designed play equipment can be considered as a novel approach to existing activities, such as swinging and spinning, enabling a wider range of children to enjoy these activities alone and together with others. The designed equipment serves all children and enables their play on equal terms. The equipment enriches the play experience of all children by enabling children with different abilities to play together. The equipment enables children to participate with minimum required effort (for example the ability to lie) and to develop their skills and strengthen their assets.

The evaluation workshop was a very good learning point for me. It was important to see how the children saw the design and to hear feedback from the concept that had been developed from the insights made in the co-design workshops. It felt like a success that both groups were excited about the concept and were eager to try out the different equipment. I was very content that I had managed to design something that was not seen as meant for a certain group of users but appealed to all children. All of the children felt that it was for them and that they would be able to play with the equipment. My personal driver in this thesis was to promote equality

and to prove that design can change the playground environment from disabling to enabling and have a positive impact on users and the way in which different users, physically disabled and visually impaired users in this case, are seen and valued. The evaluation workshops were definitely a highlight in the whole process and it was very rewarding to see that all children equally felt that they wanted to use the equipment and could use it and it was designed for them.

The idea of functional and motivational sound signals led to the idea of a game application. I found that combining sound and game features to physical playground equipment provide interesting possibilities that expand the concept of a traditional playground. The children in the evaluation workshop were open to the idea of a game application and made versatile proposals to what kind of features it could have. It was not possible to design the sound signals and the game application fully in the scope of this thesis. This thesis provides ideas to what they could be like and they should be researched and developed further. The combination of ergonomic play equipment and a game application that monitors the child's performance could work well in hospitals and rehabilitation centers. Hospitals need play places, to activate their patients and to monitor their progress. It would provide the hospital staff a way to measure the child's abilities and development and the game could also work as a tool to motivate the child to be more active.

7.3   DESIGN IMPLICATIONS

MY HYPOTHESIS THAT there is no need for special playground equipment intended for disabled children was correct. The concept of disability is irrelevant in the context of playgrounds. The parents of able-bodied children can also have restricted mobility or eyesight and can face difficulties in operating in existing playgrounds. All of the users of playgrounds can suffer from situational disability and benefit from equipment designed to support different levels of ability.

Taking a top down approach to design and designing for physically disabled children resulted in a product concept that

serves a wider range of users with different abilities. Thus designers should move away from designing for disabled or able-bodied and focus on designing for a range of abilities instead. Focusing on abilities enables designing solutions that support different levels of ability and do not require adaptation, leading to more mainstream products for a wider market. Products accepted by the mainstream market cannot be seen as stigmatizing. Designing for abilities requires awareness, familiarization with different users and putting the knowledge into practice.

Accessibility can be considered as an underlying trend regarding the playground business. The awareness of the need for more inclusive approaches as well as the legislation demanding accessible solutions has gained ground recently. Children with physical disabilities can be considered as having a leading position in regards to this trend. They experience challenges and barriers concerning existing playgrounds and are not able to participate and enjoy play environments unless their needs are met or solved in creative ways. Therefore children with physical disabilities can be considered as a valuable resource in customer need identification and focusing on identifying their needs and abilities may result in products that meet the needs of a wider range of children more profoundly and creatively. Taking an inclusive approach to design aids the promotion and creation of an inclusive society and can have a positive affect on individual users building a sense of I can and I belong.

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LIST OF FIGURES

SUPER BLUE GIANT KNITTING NANCY
HTTP://WWW.SUPERBLUE.CO.UK/ARCHIVES/NEWS/THE_GIANT_KNITTING_NANCY.HTML

ROPE FENCE
HTTP://WWW.FOTOTHING.COM/PHOTOS/2CD/2CDD9AE64FA8D7C2F87F44B76E046AE6_3BA.
JPG

FIGURE 27 IDEA BOARD SECOND CONCEPT
CIRCA DOUBLESEATER
HTTP://RAWSTUDIO.CO.UK/PRODUCTS/CIRCA-DOUBLE/

DIVA PLYWOOD LAMP
HTTP://WWW.DAILYTONIC.COM/
DIVA-BY-THOMAS-KALVATN-EGSET-AND-PETER-NATEDAL-FOR-NORTHERN-LIGHTING/

MINIMALIST HENRI STOOL
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FIGURE 28 ABILITY CHART ILLUSTRATING THE MINIMUM ABILITY LEVEL REQUIRED TO USE THE EGUIPMENT

FIGURE 29 EXAMPLES OF WHAT THE GAME APPLICATION COULD BE LIKE