



Manifesto for children's genuine participation in digital technology design and making

Marianne Kinnula*, Netta Iivari

University of Oulu, Interact Research Unit, 90100 Oulu, Finland



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ABSTRACT

We articulate in this paper what participation at its best entails in the context of digital technology design with children, forming a theoretical framework for genuine participation of children in digital technology design and making. We integrate in the framework a set of conditions for the meaningful and effective participation of children and the nexus analytic concepts of historical body, interaction order and discourses in place, and complement that with the lenses of empowerment, values and value. In addition to these theoretical lenses, we rely on the insights gained during our empirical work with children for more than a decade. We contribute to research on Child Computer Interaction (CCI) by explaining what 'participation at its best' entails in practice and how it can be studied in research. Thus, CCI researchers and practitioners advocating participation, empowerment and inclusion of children can benefit from this framework when planning, analysing and evaluating their projects with children.

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1. Introduction

Enabling children's¹ participation in designing digital technology is at the heart of Child-Computer Interaction (CCI) research and practice. There is a long history of developing methods to give children a say in technology design, starting in the 1980s (Druin, 2002). There is also a strong discourse in the CCI literature since the 1990s stating that children are the best experts in what being a child entails (Druin, 2002). Therefore, children have been invited to participate in digital technology design as testers, informants and even design partners (Druin, 2002; Yarosh, Radu, Hunter, & Rosenbaum, 2011). Different Participatory Design (PD)-oriented practices (Simonsen & Robertson, 2013) have been developed for this, and PD has strongly affected the thinking of many CCI researchers. In this paper, we use the term 'digital technology design' to refer to different design, making and digital fabrication activities aimed at creating a digital product, its prototype, a related service or some output that potentially helps in creating the product or service (such as creating a use case, a 3D design or a service blueprint).

There seems to be a need to further clarify what is meant by children's participation and what values and goals are associated with it in CCI research (Bekker et al., 2018). Researchers have

contemplated the role of children in design projects (e.g. Barendregt, Bekker, Börjesson, Eriksson, and Torgersson (2016), Druin (2002)) and suggest foregrounding the values of researchers and practitioners when working with children (Iivari, Kinnula, & Kure, 2015; Iversen & Smith, 2012; Yarosh et al., 2011). They have considered negotiating values of both adult designers and children (Van Mechelen et al., 2014) and have created models for ethics and transparency when working with children (Read, Fitton, & Horton, 2014; Read, Horton, Fitton, & Sim, 2017). Recently, researchers have also called for the empowerment of children vis-à-vis digital technology (Iivari & Kinnula, 2016a; Iversen & Smith, 2012; Iversen, Smith, & Dindler, 2017; Yarosh et al., 2011). Along these lines, researchers have argued that children should adopt a protagonist role as regards digital technology that entails understanding, critically reflecting on and even driving the development of digital technology (Iivari & Kinnula, 2018; Iversen et al., 2017). Recent CCI studies report on inviting children to be protagonists in digital technology development (Iivari & Kinnula, 2018; Iversen et al., 2017), on striving for the genuine participation of children (Cumbo, Eriksson, & Iversen, 2019; Iivari et al., 2015; Schepers, Dreessen, & Zaman, 2018c; Schepers, Schoffelen, Zaman, & Dreessen, 2019) and on providing children with long-term skills and competences regarding digital technology (Dindler, Smith, & Iversen, 2020; Iivari, Molin-Juustila, & Kinnula, 2016; Iversen, Smith, & Dindler, 2018; Kinnula, Iivari et al., 2017). These studies represent the stream of research we call for and contribute to in this paper.

Despite these recent developments, a broader reflection on what children's genuine participation means in digital technology

* Corresponding author.

E-mail addresses: marianne.kinnula@oulu.fi (M. Kinnula),

netta.iivari@oulu.fi (N. Iivari).

¹ By 'children', we mean those under 18.

design is still lacking (Iivari & Kinnula, 2016a), even though some attempts have been made (Cumbo et al., 2019; Iivari & Kinnula, 2018; Iivari et al., 2015, 2016; Iversen et al., 2017, 2018; Kinnula, Iivari et al., 2017; Nouwen et al., 2016; Schaper, Iversen, Malinverni, & Pares, 2019; Schepers et al., 2018c, 2019). However, although the CCI community obviously conducts child-centred research, children's role and contribution is not always that strong. The projects are often adult-initiated and adult-led, and the topics are largely chosen by adults. Relatively little attention has been paid to what children's genuine participation (i.e. children's participation 'at its best', cp. Chawla and Heft (2002)) should entail (Iivari & Kinnula, 2016a). Discussion on this is needed, as it would enable CCI researchers and practitioners to make conscious choices in their projects with children regarding the level of children's participation and what this necessitates in practice.

To address this research gap, we take inspiration from the Scandinavian PD tradition in which the genuine participation of users in the digital technology design process is both a decades-old practice and a current concern (see Bødker, Kensing, and Simonsen (2004), Luck (2018), Østergaard, Simonsen, and Karasti (2018), Robertson and Simonsen (2013)). For example, Robertson and Simonsen (2013) (see also Østergaard et al. (2018)) consider participation to be genuine when the participants 'participate willingly as a way of working both *as themselves* (respecting their individual and their group's/community's genuine interest) and *with themselves* (concentrating on the present to sense how they feel about an issue, being open towards reflections on their own opinions), as well as *for the task and the project* (contributing to the achievement of the shared and agreed-upon goals of the design task and design project at hand)' (Robertson & Simonsen, 2013, p. 5, original italics). Moreover, we feel that the PD literature is still somewhat limited in addressing the tenets and nuances of genuine participation and we therefore draw additional inspiration from the fields of sociology and community development, within which children's participation 'at its best' has long been a concern (Hart, 2013). From this stream of research, various models and guidelines for children's participation can be identified. These can be used for planning and evaluating projects involving children and for reflecting on the motives, values and practices underlying children's participation. Generally, in this literature children's participation is seen to aim at one or several of the following goals: to generate knowledge about children, to enable children's voices to be heard, to impact decision making, to empower children, to improve products and services for children and/or to educate children. Researchers have tried to understand and evaluate children's participation in terms of whether it has real impact or is it only tokenistic. The genuineness of children's participation has been seen to entail meaningfulness and effectiveness (Chawla & Heft, 2002) and has been addressed from the viewpoint of the participatory process itself (Hart, 1992) and the resulting outcomes (Iacofano, 1990).

We have identified additional valuable literature that deepens our understanding of what children's genuine participation entails. We have been inspired by literature on the different forms of empowerment one may aim at (see Iivari and Kinnula (2018), Kinnula, Iivari et al. (2017)) that have interesting implications for our understanding of genuine participation. We have also been inspired by the theoretical framework of 'nexus analysis' (Scollon & Scollon, 2004), argued to be suitable for addressing complex topics in depth (see e.g. Iivari, Kinnula, Kuure, and Molin-Juustila (2014), Molin-Juustila, Kinnula, Iivari, Kuure, and Halkola (2015)). This framework facilitates understanding of the societal, cultural and historical aspects underlying and shaping a social action. We argue that also in enabling children's genuine participation in digital technology design, there are various social, cultural

and historical factors that shape what happens. Our work is also informed by theoretical insights on value (e.g. Cockton (2006), Vargo and Lusch (2016)) and values (e.g. Friedman, Kahn Jr, Born-ing, and Hultdtgren (2013), Iversen, Halskov, and Leong (2010), Miller, Friedman, Jancke, and Gill (2007)); these analytical concepts enable a broader understanding of the 'why' questions around the genuine participation of children and of the value compositions, not only value chains, related to the social action of children's participation in digital technology design.

The manifesto presented in this paper is based on the insights gained from the above-mentioned theoretical lenses and frameworks and our empirical interdisciplinary work with children. It was developed collaboratively by the authors through careful analysis, reflection and discussion of each theoretical lens and their specific contributions vis-à-vis our work and this manifesto. In calling this work a manifesto, we want to make visible and honour the long line of research focusing on children's best (their empowerment and agency, best products for their use) in digital technology design. We also want to offer a more systematic, comprehensive theory-based perspective regarding the aspects that affect the genuineness of children's participation, what it entails and what it should entail when researchers and practitioners attempt to empower children and give them agency in the digital technology design process. Based on these insights, researchers and practitioners working with children can consider the most suitable level of participation. The manifesto reveals insights for raising and educating children today in order to meet their needs in the digital future. The insights are valuable for raising future protagonists (Iversen et al., 2017) and ensuring children's participation at its best (Cumbo et al., 2019; Iivari et al., 2015; Schepers et al., 2018c, 2019).

The remainder of this paper is structured as follows. Next, we discuss the building blocks of our manifesto, thus extending the understanding of children's genuine participation in digital technology design. We then present our framework of the genuine participation of children. Finally, we conclude the paper by discussing the limitations of our study and suggesting possible paths for future research.

2. Building blocks of the manifesto

In this section, we discuss the building blocks of our manifesto and present a systematic, theory-based mapping of significant issues researchers and practitioners should consider to ensure children's genuine participation in digital technology design. We describe the theoretical basis of each building block and provide select examples of related CCI research. Many of the issues discussed are inter-related but are distinguished here for analytical purposes.

We also clarify the relevance of the building blocks using an example of a digital technology design project with children. This imaginary 12-week research project is set in the context of a Finnish school with a group of children aged 11–12 (22 children making up one class) divided into teams of four or five and their class teacher. The researchers (authors of this paper) work with the children 2 h each week. The children also do some additional work at school with their teacher or do homework, all without the researchers present. In the project, the children ideate and design digital solutions for use in their school community to ease the loneliness, depression and anxiety that might result from the COVID-19 pandemic and the related social isolation. The aim is for children to understand the process of developing digital technology and how technology can be used for the common good. As we have conducted many projects with this kind of setting, we cite our own papers when relevant.

2.1. Nexus analytic perspective of social action

The first building blocks for our manifesto are offered by the conceptual basis of ‘nexus analysis’ (Scollon & Scollon, 2004). Nexus analysis is a research framework based on insights derived from various research fields and disciplines such as linguistics, semiotics, conversation analysis, discourse analysis, practice theories, and activity theory (Scollon & de Saint-Georges, 2013). Nexus analysis places social action as the unit of analysis (Scollon & Scollon, 2004). Social action is constituted by three connected aspects—historical bodies of the participants, interaction order among them and discourses in place circulating around (Scollon & de Saint-Georges, 2013), as explained below. We have used nexus analysis as our research framework for over 10 years, focusing on the social action of children participating in digital technology design and making and examining many different viewpoints. Nexus analysis has enabled us to provide interesting insights regarding children and their genuine participation in digital technology design. It sensitises the researcher to carefully determine ‘what is going on’ in a social action (Scollon & Scollon, 2004) and how historical bodies, interaction order and discourses in place shape what happens. From the nexus analysis viewpoint, it is important to look for and understand the fleeting in situ moments and to consider the long trajectories of actions, some of which span thousands of years of human history and still have an effect today. With the imaginary project used as an example in this paper, the social action under study is *children’s genuine participation in designing and making a solution for school community use*.

2.1.1. Historical body – histories and backgrounds of actors

The first central concept in the nexus analytic research framework, **historical body**, was coined by the philosopher Nishida (Nishida, 1958). It refers to the overall accumulated life experiences of people that shape their behaviour. Scollon and Scollon (2004) see Bourdieu’s (1984) concept of habitus as referring to a similar phenomenon; habitus is formed through a social process and guides people’s behaviour and thinking. However, in nexus analysis the concept of historical body is preferred as it is seen more explicitly to include bodily aspects. Overall, the concept makes visible how our backgrounds, histories, experiences, knowledge, skills, expertise and dispositions underlie our actions (Scollon & de Saint-Georges, 2013; Scollon & Scollon, 2004). These histories can extend from our personal (bodily) experiences and histories to what has happened in the histories of nations, shaping us into certain kinds of people. Our experiences are embedded in our thinking and in our physical bodies and their (unconscious) reactions to what happens. Thus, nexus analysis informs us that the *histories and backgrounds of actors shape what happens and what is even possible to happen*.

With this understanding, it is possible to make visible how and what kind of histories of participants affect the social action under study. In the example project, the topic stems from the researchers’ own experiences and understanding of what is relevant to study, both from the perspective of advancing research in the CCI field and that of personal interests. If the authors are personally happy with social isolation, it may be that they would not choose such a topic. They have also at some point in their careers chosen to study technology-related topics in connection with children and schools using certain kinds of methodology and have received funding for their research, making this particular project possible (Iivari, Kinnula, Molin-Juustila, & Kuure, 2018). At school, the principal and the children’s teacher need to see the relevance of the topic for the school community; they make their own decisions based on what they have experienced, both during their (short or long) history in certain school roles but

also in their private lives, possibly as mothers or fathers. They can also have very traditional views of what role technology can and should play in the school context (Kuure et al., 2016) or in children’s lives. Children’s own experiences of social isolation affect what they see as problems and what kind of solutions they see as helpful or not. Their understanding and previous experiences of technology use and their personal stage of development both limit and make it possible for them to consider what the solutions could be (see Iivari et al. (2014), Kuure, Halkola, Iivari, Kinnula, and Molin-Juustila (2010)), and they utilise all this knowledge to make sense of and accomplish the task assigned them. The researchers consider before the project what kind of historical body related issues might come to play at school and how this could affect the project. They conduct interviews with the school participants to understand their current issues and interests as well as their background and experiences related to digital technology and design in order to be able to adjust the plans accordingly. They continue with in-situ observations to understand which aspects relating to the historical body of the participants become foregrounded in the activities. They also self-reflect how their own historical bodies affect the choices they make themselves.

The significance of the historical body shaping any social action has been acknowledged to some extent in CCI research (Iivari, Kinnula, Molin-Juustila, & Kuure, 2017; Molin-Juustila et al., 2015; Norouzi, Kinnula, & Iivari, 2019). Some CCI researchers have noted that children’s homes, the people close to them and children’s personal interests and activities are reflected in their contributions (Katterfeldt, Dittert, & Schelhowe, 2009; Mazzone, Iivari, Tikkanen, Read, & Beale, 2010), for example, when designing games (Vasudevan, Kafai, & Yang, 2015) even when they have been encouraged to try out something new (Katterfeldt, Dittert, & Schelhowe, 2015). It has also been noted that children’s past experiences can be helpful in accomplishing design tasks (Berman, Deuermeyer, Nam, Chu, & Quek, 2018), but lack of skills and knowledge of technology (Vandeveldt, Wyffels, Ciocci, Vanderborght, & Saldien, 2015) or experience in collaborative creation and negotiation (Smith, Iversen, & Hjorth, 2015) can hinder work (Vandeveldt et al., 2015). However, the CCI literature has been quite silent regarding the influence of involved adults’ histories, preferences and experiences in shaping their activities with children.

2.1.2. Interaction order – interactions and relationships between actors

The concept of **interaction order** was coined by Goffman (1983). It refers to interaction among people and how it is constituted. In nexus analysis, attention is directed to participants in social action and how they and their interaction shape the action in question. The participants may be present or distant but either way affect the action. One may focus on socially situational aspects that include, for example, participants’ involvement and attention, but one may also consider various conventions involved in maintaining social order. Generally, it is assumed we behave differently depending on who we are interacting with, and the concept of interaction order enables us to examine this issue in social action (Scollon & Scollon, 2004). Thus, nexus analysis informs us that *interactions and relationships between different actors (both present and distant) shape what happens and what is even possible to happen*.

In our example project, interactions between project participants at school affect the work process and the results. Children’s discussions with their peers within their small teams when designing their solutions are different from how they explain their solution to researchers, their teacher or the whole class. Children can adopt ideas for their solution from other children and from

examples given by the researchers or teachers by either literally copying them or creating very similar designs. This is natural for human beings; it is the way we learn. In the design process, it is not meaningful to try to eliminate this. Rather, we should consider how to utilise this as a resource in design (see e.g. Kuure et al. (2010)). The presence of a video camera for data collection can also affect the interaction and turn it in a certain direction. Children possibly also discuss the project with their parents, siblings or friends, and those reactions help shape the children's own thoughts about the project. More distant audiences can also shape children's work, for example, when children voice their parent's opinions on social isolation or technology as their own (see Molin-Juustila et al. (2015)). Another example is the class teacher, who is aware of the principal's expectations and acts accordingly in the project. Therefore, it is important not only to pay attention to the participants in situ and to their established and evolving interaction order but also to be aware of more distant others who can potentially have a strong voice through the participants. The researchers consider the potential interaction order related issues prior the design project through interviewing the teacher about the class and interactions within. To understand the evolving interaction orders, they conduct in-situ observations in order to be able to intervene in case of problems (such as bullying among children or the teacher or researchers emerging as too strong authority figures, directing children's creations too much), while mostly interaction orders are appreciated as naturally emerging in interaction, not to be interfered with.

In-depth analyses on this topic have not been a particular focus in CCI research, although extensive studies on different kinds of adults and their interactions with children in digital technology design projects can be found. A large number of actors in different roles have been identified as participating in design activities, such as teachers, parents, peers, researchers, facilitators, mentors, youth workers and different experts, all with varying responsibilities (e.g. Bar-El and Zuckerman (2016), Bekker, Bakker, Douma, van der Poel, and Scheltenaar (2015), Berry et al. (2010), Blikstein (2013), Chu, Quek, Bhangaonkar, Ging, and Sridharamurthy (2015), Fitton, Read, and Dempsey (2015), Giannakos and Jaccheri (2013), Golsteijn, van den Hoven, Frohlich, and Sellen (2014), Katterfeldt et al. (2015), Litts (2015), Posch, Ogawa, Lindinger, Haring, and Hörtnner (2010), Pucci and Mulder (2015), Smith et al. (2015), Vandevelde et al. (2015), Vasudevan et al. (2015), Wardrip and Brahms (2015); see also Molin-Juustila et al. (2015), Norouzi et al. (2019), Ventä-Olkkonen, Hartikainen, Norouzi, Iivari, and Kinnula (2019) for discussions on the actors). Researchers have also reported how informal interactions between adults and children have relaxed the atmosphere (Kuznetsov et al., 2011). In the cooperative inquiry method (Druin, 1999), conscious relaxation of the hierarchy between adults and children is an important aspect. In parent-child co-design, supporting the process by helping the parents bond with other parents and helping children bond with other children has been considered beneficial (Yip et al., 2016). The significance of interaction order is possibly most emphasised when working with children who have special needs, as they can be dependent on their carers even for communication (see e.g. Larsen and Hedvall (2012)).

2.1.3. Discourses in place as part of our actions and shaping our actions

Nexus analysis emphasises the complex interplay between discourse and social action; one should always ask what is the role of discourse in that action (Scollon, 2001; Scollon & de Saint-Georges, 2013). Both micro and macro levels should be considered in the analysis of discourses: face-to-face interaction between participants in situ and broader societal discourses circulating around (Scollon, 2001). The concept of **discourses in place**

also underscores that all social action occurs in real time and place by human actors and their bodies (Scollon & Scollon, 2004). Thus, the physical, material settings where the social action happens (rooms, furniture, buildings or nature) have an effect on social action. Overall, nexus analysis informs us that *discourses are always part of what happens; they powerfully shape what happens and what is even possible to happen and in turn are shaped by what happens*.

In the example project, the involved adults and children engage in various kinds of discourses constituting children's participation in the project in various ways (Iivari et al., 2015). Researchers are inspired by and reproduce the existing academic discourses in the CCI research community, emphasising children's genuine participation, constructing them as valuable, equal and influential partners in the design process. Alternative discourses might also exist in which the children are constructed as, for example, 'problematic' (e.g. behaving badly, being too silent, not working on the given task) or ignorant of certain issues (Iivari et al., 2015). All these discourses have implications for the actual work done with children—how the work is organised and facilitated, what kind of roles the adults adopt in relation to children, how adults talk with school staff and how adults speak with children. There is a need for constant self-reflection of the researchers on the discourses drawn on, produced and reproduced by themselves as well as by the study participants. The researchers do not have authority on the discourses circulating around, but in problematic cases they may consider introducing alternative discourses. The discourse lens may for example help researchers to see the potential dark side of participation. Discourses circulating around in society can also strongly shape the project (Hartikainen, Iivari, & Kinnula, 2016; Luoma, Kinnula, Kuure, Halkola, & Riekkilä, 2016; Ventä-Olkkonen, Iivari, & Kuutti, 2018): public discourses on children and technology, such as debating the appropriate amount of technology use and screen time, can shape how both adults and children approach the design task and how children themselves speak about their work and its meaningfulness. The intense global discourse on the dangerousness of COVID-19 pandemic and its counter-discourses most likely also show in children's discussions on social isolation and its necessity and thus are reflected in children's creations. Regarding the 'in place' aspect, the classroom setting (the furniture arrangement, how adults physically position themselves with children, what material objects are present in the classroom, how the school building has been designed) can be seen as a silent discourse, subtly communicating about power differences between participants and proper behaviour in this setting. Adopting a reflexive stance towards such silent discourses may help researchers to understand better what is shaping what is going on in the classroom and potentially give indications on how to alter the arrangements in case of trouble.

The discourse lens has not particularly featured in CCI research. Some CCI researchers have used discourse analysis to find ways to balance power relations between children and adults (Schaper, Santos, & Pares, 2018) and to understand autistic children's experiences with different technologies (Spiel, Frauenberger, & Fitzpatrick, 2017). We argue that the use of this lens can facilitate a more multifaceted understanding of children's participation and of what factors looming in the background can affect how the participants construct their objects and legitimise their ways of working.

2.1.4. Significance of context

Altogether, nexus analysis encourages one to 'avoid uprooting words and actions from the historical bodies of the individuals performing them, or disconnecting the discourses and actions from the sociocultural context of their formation and realization,

or ignoring the history of these actions and discourses for the individual and in the situation' (Scollon & de Saint-Georges, 2013). Thus, nexus analysis emphasises specific contexts—historical and social/societal contexts and specific places and times in which social action happens and in which human actors and their bodies are engaged. The central message of nexus analysis is that *everything happens in context*. It is important to note that we use context as a broader concept than culture; a wide variety of contexts, such as cultural, social, political, historical, physical and even aesthetic, can be identified.

As for acknowledging the context, the researchers in the example project discuss the contextual factors broadly before initiating the project. The project occurs in one Nordic country, one particular city, one particular school and one particular classroom in that school, a microcosmos that is both isolated, having its own culture, and connected to everything around it (Iivari, Kinnula, Kuure, & Keisanen, 2020). Learning goals for the project are tailored to fit with the Finnish curriculum and the school's special focus area (community). Working methods and ways of communicating with the children in this particular context are considered suitable due to the relaxed atmosphere in Finnish schools and the low hierarchy between children and teachers and adults in general in Finland. Thus, we keep in mind what is appropriate and expected in this culture, as cultural assumptions and views heavily influence what the actors see as interesting, valuable or suitable roles and activities for the children (and adults) (Sharma, Achary, Kinnula, Iivari, & Varkey, 2020). The methods and ideals applied in this project in a Nordic context with a particular value orientation might not work in other settings (Sharma et al., 2020). Regarding the context of the project, it is also important to note that it is part of the children's normal schoolwork; for the children, the activities might appear different and exciting compared to normal school day activities, but they still happen in their own classroom during regular school days. The researchers need to interpret the children's behaviour as related to the context; some children are very interested in the activities and are eager to engage in them and others are clearly uninterested in concentrating on the work. If the activities were happening elsewhere or were part of the children's hobbies, the situation might be different.

Some CCI studies clearly show the significance of context vis-à-vis the activities. Researchers have noted, for example, that the strong do-it-yourself attitude in Maker philosophy does not fit easily with certain cultural aspects in India (Somanath, Oehilberg, Hughes, Sharlin, & Sousa, 2017), that the cultural significance of the design object has an important role in empowering immigrant children in Germany (Meintjes & Schelhowe, 2016) and in helping American Indian girls to adopt the identity of a 'scientist' (Searle & Kafai, 2015), that the change from the non-traditional environment compared to the traditional classroom or vice versa can help some children do better in the activities (Otero & Blikstein, 2016), that the design space has an effect in the design process (Makhaeva, Frauenberger, & Spiel, 2016) and that a combination of a child-led nature context and a respectful adult presence can lead to new insights (Cumbo et al., 2019). Cultural forms have also been used as vessels of computer-based learning experiences (Horn, 2018). With the COVID-19 situation, homes have also become increasingly important contexts for children for many different purposes. We will discuss and give examples of context-related issues in the next sections.

Overall, the theoretical concepts of nexus analysis open a window for both researchers and practitioners to see how children's genuine participation in digital technology design does not happen in isolation, even though it might happen in a closed classroom or laboratory with a particular group of people; it happens as part of the complex web of life. Therefore, if we aim

for the genuine participation of children in our practical plans for activities or in our analysis of them afterwards, we cannot ignore the complexity of real life, where participants' (children and adults) backgrounds and experiences, their relationships and interactions and various kinds of discourses circulating around shape this complex social action.

2.2. Effective and meaningful participation of children

Children's participation is a central research topic in CCI but has also been a focus in other research fields. Of the various models for children's participation proposed in other disciplines, we have found the one presented by Chawla and Heft (2002) particularly useful in planning our work with children and in evaluating and analysing the projects afterwards (see e.g. Iivari and Kinnula (2016a), Iivari et al. (2015)). Robertson and Simonsen's (2013) thoughts on genuineness in PD resonate well with the model. The Chawla and Heft model is based on the results of a workshop focusing on children's participation in community development projects. Chawla and Heft (2002) present a set of conditions that should be considered when facilitating children's meaningful and effective participation, that is, participation that actually has an effect. We interpret these conditions as one set of criteria for the genuine participation of children in (digital technology design) projects and argue that *these conditions need to be considered when we want to truly involve children and want their work to have a genuine impact*. We therefore used these conditions to inform the manifesto, arguing that these issues are central when we work with children. We want to note that nexus analytic concepts, particularly historical body and interaction order, are useful to consider in relation to the conditions as well. Chawla and Heft (2002) divide the conditions into five sets, as discussed next.

2.2.1. Conditions of convergence

Conditions of convergence, that is, building on the existing structures that support children's participation, are the following: *'Whenever possible, the project builds on existing community organisations and structures that support children's participation. As much as possible, project activities make children's participation appear to be a natural part of the setting. The project is based on children's own issues and interests'* (Chawla and Heft (2002); cp. Robertson and Simonsen (2013) about participating 'as themselves'). These conditions further support the significance of the context of the activities.

Regarding the example project, the researchers have taken these conditions well into account when planning the project. The project occurs in the context of a Finnish comprehensive school that is a natural setting for children and for their participation. In schools there are existing, familiar structures and processes for the children to rely on. In Finland, the existing curriculum also emphasises basing teaching on children's existing issues and interests (Iivari & Kinnula, 2016a). The example project is also devised to encourage children to base their ideas on their own issues, interests and experiences gained during the COVID-19 pandemic and to address personally meaningful problems (Kinnula, Iivari et al., 2017).

The CCI literature has already emphasised engaging with children in their natural environments and basing the work on children's own issues and interests. Much CCI work has been conducted in a school context (e.g. Bekker et al. (2015), Chu et al. (2017), Iversen et al. (2017), Vasudevan et al. (2015)). However, we do not claim that schools are the only natural context supporting children's participation; many other settings may be supportive as well, depending on the children's life experiences and habits. For example, different kinds of digital technology-related events or clubs that take place in museums, science centres or libraries may be natural places for some children to engage in, such

as drop-in makerspaces for children, managed by children (Bar-El & Zuckerman, 2016; Litts, 2015). As for basing the work on children's own issues and interests (Frauenberger, Good, Keay-Bright, & Pain, 2012), CCI research acknowledges the importance of this in, for example, the Maker Movement-inspired projects in which children have been encouraged to design and make things that are of particular interest to them. This is seen to offer children intrinsic motivation to engage in making, in line with the Maker Movement where passion and personal interest drive making (Hatch, 2014). For example, children have been invited to create self-selected game designs (Akbal, Zehle, & Schmitz, 2014; Vasudevan et al., 2015) and generally to make personally meaningful objects and tools in the Makerspaces (Bar-El & Zuckerman, 2016; Katterfeldt et al., 2015; Litts, 2015; Posch et al., 2010).

2.2.2. Conditions of entry

Conditions of entry are related to the inclusion/exclusion of participants: *'Participants are fairly selected. Children and their families give informed consent. Children can freely choose to participate or decline. The project is accessible in scheduling and location'* (Chawla & Heft, 2002).

Considering the example project, these conditions have been taken into account relatively comprehensively. School is considered as a suitable site as it is accessible for children in terms of scheduling and location and inclusively reaches large groups of children. However, even if an entire class of children is engaged in this project, other classes in the same school and other schools are missing out; thus, inclusion always goes hand in hand with exclusion, and it is impossible to involve all (see also Iivari et al. (2018)). It is also problematic that the setting does not support voluntary participation of children in this project: the teacher decided to include the entire class in the activities as those were considered valuable for the children's learning; hence, the children cannot decline to participate (Iivari & Kinnula, 2016a). Children and their guardians are asked for their assent/informed consent for the data regarding their children's work to be collected for research purposes, though. This leads to a situation where the researchers divide children into two groups: the ones with assent/consent and those without. For practical reasons, they need to give more attention to the ones with assent/consent to get better quality research data. Some children do not want to collaborate with researchers or even with the other children, and the researchers wonder whether this is related to the fact that they were not able to choose whether they want to participate or not. The researchers decided to adapt to the teacher's wish to include everyone, while they understand this decision may have different kinds of consequences.

As mentioned, many CCI studies have been conducted in the school context. Thus, the accessibility and inclusiveness of the activities have been quite high for children; at least, particular school classes have been involved. In some of these studies, however, children's participation has not necessarily been voluntary if the activities have been part of their basic education. Some studies in the school context have also examined electives or after-school activities, in which case children's participation likely has been voluntary (e.g. Katterfeldt et al. (2015), Vasudevan et al. (2015)). Moreover, many studies address children's activities in informal learning settings, such as in different kinds of computer, programming, robotics or Making-related clubs or events at, for example, libraries, science centres, museums or Fab Labs (e.g. Bar-El and Zuckerman (2016), Chu et al. (2015), Katterfeldt et al. (2015), Litts (2015)). In these settings, participation again is likely voluntary. However, concerning inclusiveness, it is problematic that these clubs or events may attract very particular kinds of children and thus may be involved in creating various kinds of digital divides and exclusions; large groups of children may be

excluded if the activities are available only in voluntary settings emphasising particular computing-related topics and interests that most children are (yet) unfamiliar with. Moreover, there seems to be little CCI research explicitly contemplating issues intermingled with the conditions of entry, except for studies addressing ethical issues in children's participation, the voluntariness of participation and the assent/informed consent of children (e.g. Read et al. (2013)).

2.2.3. Conditions of social support

Conditions of social support are related to interaction between participants: *'Children are respected as human beings with essential worth and dignity. There is mutual respect among participants. Children support and encourage each other'* (Chawla & Heft, 2002). We argue that these conditions bring increased understanding of the influence and shaping of interaction order among the participants in the collaborative process.

In our example project, the researchers quite heavily rely on the teacher in ensuring these issues. The class teacher participates in the project and she has expertise and is equipped to handle the type of issues in the project through her education and work experience (Iivari & Kinnula, 2016a). The participating researchers naturally aim at facilitating mutual respect, support and encouragement among all participants as well. They try to be sensitive when choosing all material and working methods, to ensure they encourage positive and supportive atmosphere rather than negative and controlling. They also use polite and friendly language, give the children possibilities to voice their opinions and listen to the children. The researchers are aware that it requires significant sensitivity to recognise and deal with bullying and teasing among children in the classroom; in this project they faced situations where children were reluctant to work with other children in general or with certain children in particular (Iivari et al., 2015). As their expertise in this respect is relatively limited, they turn to the teacher with these and other challenging (groupwork) situations.

A particular strength of CCI research is the abundance of research on the methods for facilitating collaboration and supporting and encouraging children's participation in design sessions. Just to mention few, being open to new group members and trusting them (Somanath et al., 2017) and showing interest in each other's ideas (Kafai & Vasudevan, 2015) have been identified as supportive behaviour. In cooperative enquiry, the mixing ideas technique was specifically developed for building team cohesion and supporting and encouraging children in the design process (Guha et al., 2004; Guha, Druin, & Fails, 2013). However, we wish to point out that related to handling interpersonal issues and group dynamics, CCI researchers tend not to be specifically educated or trained and may therefore need the help of experts.

2.2.4. Conditions of competence

Conditions of competence are related to ensuring children's competence development and influence in collaborative projects: *'Children have real responsibility and influence. Children understand and have a part in defining the goals of the activity. Children play a role in decision-making and accomplishing goals, with access to the information they need to make informed decisions. Children are helped to construct and express their views. There is a fair sharing of opportunities to contribute and be heard. The project creates occasions for the graduated development of competence. The project sets up processes to support children's engagement in issues they initiate themselves. The project results in tangible outcomes'* (Chawla and Heft (2002); cp. Robertson and Simonsen (2013) about participating 'with themselves').

Our example project is specifically designed for children's competence development; the children are to gain skills and

competencies in digital technology design and in design for the common good. The teacher, in collaboration with the researchers, has planned how the project fits with the curriculum and defined learning goals for the project considering different subjects; math, Finnish language and arts and crafts lessons are used for the project work, with the teacher ensuring suitable learning activities related to each subject are included (Iivari & Kinnula, 2016a, 2016b; Kinnula, Iivari et al., 2017). In addition to competence development, tangible outcomes are also created: actual digital solutions aiming to ease the loneliness, depression and anxiety that can result from the COVID-19 pandemic and related social isolation are designed and experimented with by the children during the project and by the entire school community after the project (Iivari & Kinnula, 2016a, 2016b; Kinnula, Iivari et al., 2017). The children hold very influential positions in the project; they make decisions on the goals and outcomes of the project, for example through voting (Iivari & Kinnula, 2016a, 2016b; Kinnula, Iivari et al., 2017), and they are invited to act as leaders on their own teams (Kinnula, Molin-Juustila, Sánchez Milara, Cortes, and Riekkö, 2017). However, the adults involved decided the overall goals for the project prior to the children's participation; thus, the children did not initiate the entire project. In the actual design process, informing the children properly is emphasised so they can make informed decisions; however, informing children in age-appropriate manner is somewhat challenging when the researchers try to carefully follow the requirements set by the European General Data Protection Regulation (GDPR). Moreover, attention is paid to helping the children initiate similar kinds of projects in the future; the researchers and the teacher try to make it clear to the children that this type of community development project can be initiated by the community members themselves to address relevant problems, utilising design and technology for the common good.

CCI research has emphasised children's learning and competence development overall (Yarosh et al., 2011). Children's skills and competencies around digital technology, design and making have often been underscored (e.g. Bekker et al. (2015), Iversen et al. (2017), Katterfeldt et al. (2015)). Tangible outcomes have been almost a default in CCI studies that typically develop different kinds of prototypes in collaboration with children. Children's roles have ranged from being informants or testers to design partners (Druin, 2002). However, recent literature has argued for giving them even more significant positions to drive the development of digital technology as protagonists (Iversen et al., 2017). Methods ensuring that all children's ideas are appreciated and accounted for (Guha et al., 2004; Read et al., 2014) have been developed, and the proper informing of children (Read et al., 2014, 2013) and the significance of their designs and subject knowledge have been underscored (Yip et al., 2013). However, in many CCI studies children have only been making decisions during the design process and therefore have only been informed about design process level issues, thus limiting their learning. In the future, more child-centered or child-driven decision-making processes concerning the overall goals and outcomes of the projects should be explored. More emphasis should also be placed on helping children initiate future projects themselves.

2.2.5. Conditions for reflection

Conditions for reflection are related to transparency between adult and child participants and to the possibilities for participants to evaluate and reflect on both the process and the outcome of the collaborative process: *'There is transparency at all stages of decision-making. Children understand the reasons for outcomes. There are opportunities for critical reflection. There are opportunities for evaluation at both group and individual levels. Participants deliberately negotiate differences in power'* (Chawla and Heft (2002);

cp. Robertson and Simonsen (2013) about participating 'for the task and the project').

The example project tries to invite children to become decision makers. The children naturally make many smaller scale design decisions, but they are also allowed to decide the digital solutions to be delivered in the project (Iivari & Kinnula, 2016a, 2016b; Kinnula, Iivari et al., 2017). The researchers identified decision-making situations the children can take part beforehand, as they see decision making as an important skill to learn; they also carefully considered how they can make visible the decision points that affect the next phases of the work and help children make informed decisions. The researchers are aware of the power differences between adults and children as addressed in the CCI literature and discussed this issue both with the teacher and the pupils. In Finnish schools, teachers are not looming authority figures, but clear power differences still exist, and it seems impossible to remove them during a single project. Regarding the evaluation, children are considered the most important evaluators of the project process and outcome. They are invited to evaluate the solutions they developed using criteria they helped construct and are invited to facilitate usability evaluations in which children from other classes are invited to evaluate the solutions. In addition, the children are interviewed, fill in questionnaires and write an essay on the project progress to give further opportunities for reflection, and also for research data collection purposes (Iivari & Kinnula, 2016a, 2016b; Kinnula, Iivari et al., 2017). One challenge is to stimulate children's reflection during the process. Children are asked to write a reflective journal during and after each session, but that has not been a success so far (Iivari & Kinnula, 2018).

Similar to the conditions of competence, CCI researchers have touched upon decision making and its transparency in the design process in the sense of trying to value and acknowledge all the ideas generated by children and by trying to make it visible how the design process proceeds based on those ideas (Guha et al., 2004; Read et al., 2013). Power differences between adults and children are a decades-old concern in CCI research. In particular, the power difference between children and teachers has been criticised, and CCI research has tried to change the dynamics (see e.g. Druin et al. (1999), Guha et al. (2013)). For example, the long-term commitment of children and adults to work using the cooperative inquiry method helps in overcoming power differences as people get to know each other (Guha et al., 2013). In CCI research, it has also been a common practice to invite children to evaluate the process and/or the outcome of projects (see e.g. Druin (2005), Guha et al. (2013)). Reflection on both the design process and outcome may be an explicit phase in the design process (Bekker et al., 2015; Smith et al., 2015). An evaluation after a longer period of time has also been conducted to understand the user gains in participatory design (Bossen, Dindler, & Iversen, 2010).

2.3. Different forms of empowerment

Literature on the effective and meaningful participation of children underscores supporting children's participation with relevant and interesting activities and giving children responsibility and the possibility of having influence. The concept of empowerment particularly underscores the latter aspects (Kinnula, Iivari et al., 2017). Literature on empowerment enables going deeper into what this means and into the variety of associated issues. Different forms of empowerment identified in the literature, such as critical, mainstream, functional, democratic, and empowerment as learning and competence development (Kinnula, Iivari et al., 2017), show that this responsibility and influence can be interpreted in different ways. The mainstream form of empowerment sees empowerment as motivating people through

increased decision-making power achieved through the powerful giving some decision-making power to the power-weak. The critical form sees this as insufficient and instead emphasises the oppressed challenging the oppressive conditions of the status quo, combating the oppressors and thus gaining more decision-making power (Hardy & Leiba-O'Sullivan, 1998; Howcroft & Wilson, 2003; O'Connor, 1995). The functional form of empowerment views empowerment in the sense of improving the life conditions of people while maintaining the status quo, for example, by developing better tools for people to use. The democratic form emphasises people's ability to affect decisions concerning them (Clement, 1996). Finally, empowerment as learning and competence development emphasises giving people skills and competencies for the future to enable them to reach their full potential, participate fully in society and control their destinies (Kinnula, Iivari et al., 2017). We emphasise that when organising activities for children, it is critical to explicitly ask what kind of empowerment we want to aim for in this particular activity. We maintain empowerment can be realised by creating better tools, improved learning and competence, increased decision making or increased agency to make changes for the benefit of the oppressed.

In our example project, the empowerment of children in and through digital technology design is emphasised in several senses. To begin with, empowerment in the form of learning and competence development is central; children are being offered useful skills and competencies in digital technology design that should be valuable for them in the digital future. At the same time, we are in collaboration with children developing digital tools aiming to ease the loneliness, depression and anxiety associated with the COVID-19 pandemic and the related social isolation. Thus, children are empowered by improving their life conditions through better digital tools. The children are also being given increased decision-making power, connecting with their democratic empowerment: they are allowed to figure out among themselves what kind of digital tools they will develop. However, we must admit the school context prohibits democratic empowerment in a more complete sense; the project has been ideated and defined by adults who set the boundaries for children's empowerment and ability to participate in the decision making. It is likely the project set-up motivates pupils in line with the mainstream sense of empowerment, while the critical sense is almost lacking in our project. The children are not invited to critically scrutinise the oppressive conditions of the status quo and to combat them. The digital solutions they are developing for school community use touch upon the tenets of critical empowerment; the children are trying to improve the life conditions of those marginalised or suffering due to the current situation, indicating a sense of social responsibility. However, the critical form of empowerment would require more explicit handling of the critical tradition and power issues involved than what is reasonably possible in this project.

The empowerment of children is clearly an important objective for CCI researchers. A large part of CCI research has focused on building better tools for children's use and on children's learning and competence development (Yarosh et al., 2011). Empowerment in the mainstream sense can be connected with all studies inviting children to make design decisions, something they have not had an opportunity to do before. Empowerment in the democratic sense has also been targeted, for example, by creating more democratic design practices (Read et al., 2014) or, particularly with the vulnerable group of children with special needs, finding such methods that enable them to be heard (e.g. Barendregt et al. (2018), Larsen and Hedvall (2012), Makhaeva et al. (2016)), often in a PD context. For children's empowerment in the critical sense, the role of the protagonist—that is, aiming for children to critically reflect on technology use and even drive its development (Iversen

et al., 2017)—is a recent addition. Further research on empowering children in the critical sense is needed. More generally, CCI researchers have not typically clearly identified what type of empowerment they are aiming for and for what purpose. A broader discussion on empowerment goals and associated practices is warranted. It is also important to note that only the critical form is truly child-centred and driven; the other forms rely heavily on adults acting as the main decision makers and gatekeepers. For this reason, CCI researchers and practitioners as a community need to take a very reflective stance regarding the empowerment of children.

2.4. Values affect what we do and what value we gain

The literature on effective and meaningful participation is clearly driven by values. Researchers aim to enable children's voices to be heard, to impact decision making, to empower children, to improve products and services for children and/or to educate children, motivated by value-laden and ethical issues. In addition, for sustainable practice it is important to consider the value to be generated for participants. Values and value, that is, worth, can be seen as related. Values refer to what is considered important, good and right (e.g. Friedman et al. (2013), Iversen et al. (2010), Miller et al. (2007)), and this influences what is considered as value, that is, a benefit experienced, perceived and determined by the beneficiary (Vargo & Lusch, 2016), something a person judges to be worthwhile (Cockton, 2006). The frameworks discussed earlier do not address values or value in depth. Therefore, we have extended the theoretical framework with literature on these two concepts. The importance of values in driving people's behaviour, including technology design and use, has been acknowledged (e.g. Friedman et al. (2013), Iivari et al. (2015), Isomursu, Ervasti, Kinnula, and Isomursu (2011), Iversen et al. (2010), Iversen and Smith (2012), Kinnula, Iivari, Isomursu, and Kinnula (2018), Miller et al. (2007), Nouwen, Van Mechelen, and Zaman (2015), Zaman and Abeele (2010)). Studies have also shown that both value compatibility and conflicts are possible in digital technology design and use, with value compatibility contributing to the activity and conflicts hindering it (Ventä-Olkkonen, Lanamäki, & Iivari, 2017). Based on the literature, we can conclude that *everything we do is affected by our (cultural) values*.

Our example project includes value considerations to a certain extent. The researchers have long been inspired by the Scandinavian PD values and have conducted empirical analyses on values as shaping technology design (Hartikainen, Iivari, & Kinnula, 2019) and use (Isomursu et al., 2011). Therefore, the project began by explicitly discussing the values involved in setting the objectives for the design process and in choosing participants and working methods. In addition to PD values, each researcher's personal values and the cultural values characterising Finnish society and basic education were recognised to drive the choices made. The teacher's participation naturally affected the choices made as well, while her background and value orientation were well aligned with those of the researchers, addressed during informal discussions early on in the project. However, the project lacks an explicit discussion of the values of the participating children.

There have been specific calls in the CCI research for foregrounding the values when working with children (Iivari et al., 2015; Iversen & Smith, 2012; Van Mechelen et al., 2014; Yarosh et al., 2011) as well as attempts to create practical tools for identifying, reflecting and negotiating values in a design project (Van Mechelen et al., 2017, 2014) and considering different ethical issues (Read et al., 2014, 2013). For example, CCI researchers have developed a methodology for identifying the underlying values embedded in co-design outcomes (Van Mechelen et al.,

2017) and values-related design guidelines in relation to parents' role in children's online engagement (Nouwen et al., 2015; Nouwen & Zaman, 2018). The values of children themselves have not been studied extensively by CCI researchers, although CCI researchers have consciously tried to embed certain values in the design process (Iversen & Smith, 2012). Cultural values and context are closely related, as the culture-related examples presented in relation to nexus analysis and the significance of context show. Values relate not only to culture; personal, professional/occupational, research and design tradition-related values can also be considered.

Kujala and Väänänen-Vainio-Mattila (2009) note that to understand users' perspective on value, one needs to understand what is important for them and what motivates them. Thus, values and value are intertwined. In the context of genuine participation, it is important that the work aligns with the values of the actors and that the actors perceive and experience benefits from the work, that is, that they derive value. The literature on effective and meaningful participation informs us that the value generated may relate to the process, to the outcome or to both (Hart, 1992; Iacofano, 1990). The value gained may concern some tangible outcome but also learning and competence development (Chawla & Heft, 2002; Iivari & Kinnula, 2016a; Kinnula, Iivari, Isomursu, and Laari-Salmela, 2018). Objectives for the design project are linked to what kind of value we expect different stakeholders to experience. Objectives can be oriented to the (material) outcome of the project or seen to form in the process of the project, in the actual design work and in the interaction between different actors (Chawla & Heft, 2002; Iivari & Kinnula, 2016a). Children's competence development or children having fun when working in the project are examples of a process-oriented objective, whereas a new product for children's use is an example of an outcome-oriented objective. Of course, there may be many objectives, and they can be both process- and outcome-oriented and something in-between. Overall, we argue that *all actors need to perceive receiving value to want to take part in a process. This value can be related to the (collaborative) process or its outcome.*

In our example project, value is realised for children both in the sense of a tangible outcome and competence development. Children are being offered new skills and competences through participating in the project, while the digital solutions are expected to be of use after the project has ended for the children and the larger school community. The project addresses an important current issue in children's lives and offers an opportunity to experience something different and to have some fun, which is appreciated by children (cf. Iivari et al. (2020), Kinnula, Iivari, Isomursu, and Laari-Salmela (2018)). The teacher has been more explicitly able to shape the project process and when we interview her she tells that she is happy with the project as it offers a valuable opportunity to develop her competence and teaching practices (cf. Iivari and Kinnula (2016b), Kinnula, Iivari, Isomursu, and Laari-Salmela (2018)). For the researchers, the project also generates a lot of value, as it offers important empirical experiences in digital technology design with children, addressing relevant social problems and working in a child-centred and -driven manner (cf. Kinnula, Iivari, Isomursu, and Laari-Salmela (2018)). After the project, we plan to ask the children themselves what kind of value they experienced in terms of the process and the outcome, as we know that experienced value is always determined by the actors themselves (Kinnula, Iivari, Isomursu, and Laari-Salmela, 2018).

CCI researchers have emphasised the importance of children perceiving value in collaborative efforts to an extent. For example, CCI researchers have found that having fun can be a benefit for children (Börjesson, Barendregt, Eriksson, Torgersson, & Bekker, 2019; Schepers, Dreessen, & Zaman, 2018b), similar to

the development of self-esteem, learning by doing, broadening horizons (Schepers, Dreessen, & Zaman, 2018a), collaboration and communication skills, design process knowledge and confidence (McNally, Mauriello, Guha, & Druin, 2017). In the school context, children and teachers both learning more about technology has also been identified as important value gained from participating in the design process (Börjesson et al., 2019).

3. A framework for the genuine participation of children in digital technology design

With this manifesto, we offer a theory-based perspective on the kind of elements we see as affecting the genuineness of children's participation in digital technology design—participation at its best. Next, in light of the previous sections, we propose a framework for the genuine participation of children in this context.

This paper set out to clarify what is meant by the genuine participation of children. We see a lot of value in the existing definitions and views presented in the Scandinavian PD literature (see Bødker et al. (2004), Luck (2018), Østergaard et al. (2018), Robertson and Simonsen (2013)) that is widely considered as the value-basis for CCI research, and the literature on children's participation (Hart, 2013). However, we think the CCI field would benefit from a more structured approach. Hence, we propose a framework for the genuine participation of children in digital technology design in Table 1.²

Based on our work with children and on the existing literature, we posit that genuine participation generally aims at 'participation at its best', which most notably entails meaningful and effective participation (Chawla and Heft, 2002). Participation must be **meaningful**; it must be motivating, address relevant and interesting issues from the participants' perspective and generate value for all the participants, children and adults. Participation must also be **effective** in the sense of giving the participants increased decision-making power to make informed decisions and the ability to have an impact and make changes, particularly for child participants. In addition to having a say, genuine participation also involves inviting the participants to evaluate the project progress and outcomes.

Genuine participation is always **contextual**; it occurs in a specific time and place by specific people, embedded within particular cultural contexts with associated cultural values and discourses circulating around. Context sensitivity entails taking the participants as individuals, with their evolving relationships and interactions. Genuine participation must acknowledge, try to adapt to and take advantage of these context-sensitive factors; there is no one size fits all as regards genuine participation in this sense. Therefore, in truly genuine participation, we need to consider all actors and build their participation on who they are as human beings, as we see that the basis for children's genuine participation needs to be constructed through taking the same stance with all actors, whether they are children or adults, organisers (e.g. researchers or teachers) or are just participating in the activities. With children, this means that we first need to consider their developmental stage and tailor the activities and expectations to fit that, remembering not only cognitive but also motor skills, which can be challenging (e.g. because children of the same age do not necessarily develop similarly). We need to consider all issues related to interaction order, many of which CCI researchers have identified as influential in digital technology design sessions,

² A reflective tool addressing the theoretical framework presented in this paper can be found in Kinnula and Iivari (2019); see also Sharma et al. (2020) and Kinnula, Iivari, Sanchez Milara, and Yitalo (2020) regarding the use of the framework and the tool.

Table 1
The framework for the genuine participation of children in digital technology design.

Dimensions	Characteristics of the dimensions: participation ...
Meaningful	Is motivating (Chawla & Heft, 2002; Greenbaum & Loi, 2012; Robertson & Simonsen, 2013) Addresses relevant issues (Chawla & Heft, 2002; Robertson & Simonsen, 2013) Generates value for all participants (Hart, 1992; Iacofano, 1990; Robertson & Simonsen, 2013) Acknowledges and makes visible objectives of different stakeholders for the design work both in terms of the design process and the intended outcome (Chawla & Heft, 2002; Iivari & Kinnula, 2016a)
Effective	Gives increased decision-making power (Chawla & Heft, 2002; Greenbaum & Loi, 2012) Makes informed decisions possible (Chawla & Heft, 2002) Allows participants to have an impact and make a change (Chawla & Heft, 2002; Robertson & Simonsen, 2013) Invites participants to take part in planning the process and its goals (Chawla & Heft, 2002; Robertson & Simonsen, 2013) Invites participants to evaluate the project progress and outcomes (Chawla & Heft, 2002; Robertson & Simonsen, 2013)
Contextual	Takes place in a specific time and place and with specific people (Greenbaum & Loi, 2012; Scollon & Scollon, 2004) Takes participants as individuals with particular backgrounds, histories, experiences, preferences, relationships, interactions (Scollon & Scollon, 2004) Acknowledges the different starting points of participants and helps them to participate the best they can (Chawla & Heft, 2002; Scollon & Scollon, 2004) Acknowledges and tries to adapt to and take advantage of context-sensitive factors and issues (Scollon & Scollon, 2004) Acknowledges the embeddedness within particular cultural contexts with associated (cultural) values and discourses circulating around; aims for cultural fit (Carrigan & Attalla, 2001; Greenbaum & Loi, 2012; Scollon & Scollon, 2004), (Carrington, Neville, & Whitwell, 2010; Lai, 1995; Sheth, Newman, & Gross, 1991) Builds on existing structures (Chawla & Heft, 2002)
Political	Acknowledges inherent power, politics and social issues; also acknowledges distant audiences (Greenbaum & Loi, 2012; Scollon & Scollon, 2004) Is open and explicit about power differences among the participants and negotiating those differences (Chawla & Heft, 2002) Makes a conscious choice between which forms of empowerment are aimed for (Kinnula, Iivari et al., 2017) Is sensitive to the inclusion and exclusion dynamics involved and tries to ensure as inclusive, voluntary, respectful and empowering an approach as possible (Chawla & Heft, 2002; Greenbaum & Loi, 2012; Iivari et al., 2018)
Educational	Aims for competence development of participants (Chawla & Heft, 2002) Plans development of agency to initiate action in the future as one of the outcomes (Chawla & Heft, 2002) Aims for mutual learning between participants (Greenbaum & Loi, 2012)

such as communication difficulties between children and adults, children's lack of social skills and children's lack of referents (whether technological, social or cultural). The adult participants can also lack some useful/necessary skills and competences, both cognitive and social. Considering this is important, too, as it has an effect on both their own participation and that of children.

In addition to context sensitivity, genuine participation is always **political**; there are inherent power, political and social issues involved. Genuine participation means being open and explicit about power differences among the participants and negotiating them. Genuine participation must be sensitive to the inclusion and exclusion dynamics involved and try to ensure as inclusive, voluntary, respectful and empowering an approach as possible. Genuine participation should aim at ensuring human respect and dignity in all situations and try to serve those who are oppressed, marginalised and dominated. Finally, genuine participation is always **educational**; it is not only about developing useful products and services, but it must always be also about the competence development of the participants, aiming for mutual learning; giving the participants useful skills and competencies so they may reach their full potential. In this, the adult participants have a key role. The ultimate aim we might have in our minds is have children be protagonists as regards digital technology (Iversen et al., 2017), with children being independent actors driving digital technology design. However, adults are needed in order to make it possible for children to participate in digital technology development activities. They are needed to plan and arrange these activities and to teach, guide, facilitate, instruct, and scaffold children in performing them. Parents are also needed to make children's participation possible by taking care of everyday tasks, such as scheduling, driving and feeding their children.

By participants, we refer to everybody who takes part in the activities, be they children, adults, organisers or 'mere participants.' We see children's participation as inseparable from everything else; it is intertwined with everything around it. We argue that the working methods and practices in digital technology design with children should be critically examined, as

all dimensions of genuine participation affect how the work is planned and executed in practice. It is therefore essential to consider the methods and practices from the viewpoint of what kind of message is embedded in them. We want to stress that if the intention is to truly empower children and have them adopt the role of protagonists (Iivari & Kinnula, 2018; Iversen et al., 2017) as regards digital technology, it is critical to consider what kind of conditions and contexts support this aim and what can hinder it and how the theoretical issues presented in this paper should be reflected on in practice. We acknowledge that in real-life conditions it is not always possible or practical to address everything mentioned here. It is always possible, however, to make a conscious choice to include something or exclude something for a good reason, for example, to adapt to the cultural context, and to determine how certain issues fit in order to find the best possible form of participation in the circumstances. We argue that researchers and practitioners aiming for the genuine participation of children, their empowerment and to have children become protagonists as regards digital technology, need to make the conscious choices that are visible to ourselves, to other participants and to the readers of our publications to advance understanding of what genuine participation entails in practice. We want to stress, however, that we do not see the use of a particular method or approach (for example PD) or the goal of children as protagonists as the most important aim for all work with children in the context of digital technology design. Instead, we maintain that whatever are the methods used or the goal for the work, the genuine participation dimensions can be used to inform the work to create *participation at its best* in the current circumstances.

It is important to note that some of the dimensions of the genuine participation can be deceptively simple. We invite readers to carefully look behind the definition and to try to catch the nuances that create the (in situ) experience for participants and to ask themselves the following questions: How can this show in practice in what I do? What different possibilities are there for things to happen? Why is the situation what it is, and what has

led to it? Who are the actors, and why them? Why are things as they are? What is going on here?

4. Conclusion

With this manifesto, we call all researchers and practitioners interested in empowering children and aiming for their genuine impact on the digital technology design process and its outcome to carefully consider the theoretical elements presented in this paper when planning their research or practice. Much good work has been accomplished by CCI researchers regarding most of the dimensions of genuine participation discussed in this paper, and the citations in this paper are just some examples of existing studies. We call for a more structured approach to children's participation to help conceptualise what we mean by children's participation in digital technology design, what our aims are and how we achieve them. The dimensions of genuine participation of children presented in this paper advocate a deep, highly sensitive analysis on participation, and they have been built specifically with and for CCI research. We maintain that the dimensions are also relevant when working with other groups of vulnerable or underserved participants; however, they are particularly challenging, interesting and important when working with children. We call researchers seeking the empowerment and inclusion of children to use the dimensions of genuine participation when planning, analysing and evaluating their projects.

There remain many open questions that must be addressed in future research. With any group of participants, it would be interesting to study what everyday environments could be relied upon as sites of engagement and how supportive their structures and processes would be for genuine participation. Comparisons of different sites of engagement could offer very valuable insights. Another interesting topic for future study would be discourses on the (genuine) participation of children in contemporary society and in our everyday environments (such as in school or among parents), how such a topic is discursively constructed and how such discourses are frozen into tools, practices, arrangements, infrastructures and architectures that affect the possibilities to participate. Future research in the sense of careful examination of in situ interactions among participants is also warranted in any project aiming at genuine participation. Both discourses and actions should be examined from the perspective of how the participants position themselves, other participants, and their relationships. Mutual support and respect should characterise such projects, but our experiences indicate that this is not necessarily the case. We also see interesting opportunities for future research relating to the analysis of the actual artefacts participants have created and the discourses inscribed in them as well as research relating to participants' learning and competence development during digital technology design; careful scrutiny of the various forms of learning and competence building taking place is needed. We also see the concept of empowerment – the general aim of genuine participation – as an intriguing topic for future work. Empowerment can mean many different things, however, and it is important to critically consider which meanings are relevant and most desirable in any digital technology design project.

Regarding the limitations of our study, we do not claim this manifesto presents a full view on what children's genuine participation can and should be, but we argue that at least all the components and dimensions are essential. Even though the building process of this framework is informed by our Nordic value system, we argue that the theories are not clearly tied to any (cultural) context. Therefore, we propose carefully looking at what is behind each element and then applying it appropriately in the context.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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