Design as an Agent of Children's Rights?
Inclusive Mobility Design for Children with Disabilities

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ABSTRACT

This chapter introduces foundational knowledge and tools to support those advocating the rights of children with disabilities to enter into discussion with the field of Design, recognising its role as an active and direct agent of children's rights. Five interrelated 'designerly ways' are discussed to explore how design can act as an agent acknowledging, integrating and facilitating the rights of children with disabilities. The field of inclusive paediatric mobility design is focused upon to provide context-specific insights. Two key directions are outlined regarding the transitioning and prioritisation of designerly ways, to help optimise Design as an agent of children's rights.

KEYWORDS

Inclusive Design; Children's Rights; Assistive Technology; Paediatric Mobility; Designerly Ways.

Interrelationships Between Children's Rights, Disability and Design

Introducing Children's Rights and Disability

Both the Convention on the Rights of the Child (CRC) and the Convention on the Rights of People with Disabilities (CRPD) state that every disabled child has the right to develop to their maximum extent possible, including the 'fullest possible social integration and individual development' (Art. 23, CRC). Despite this, availability and access to assistive technology (AT) and interventions which facilitate such development (also a right under CRPD Art. 20) varies widely across the globe, and in the majority of cases remains a neglected area of healthcare, policy, and design (Holloway et al., 2018). The term 'AT' refers to a broad range of products and services designed to maintain or improve functioning and independence to enhance quality of life (Newell, 2003) for both children and their families. Despite global efforts, there is clearly still significant need and opportunity for improvement in the design and provision of interventions for children with disabilities (Heather et al., 2016).

The CRC and the CRPD aim to protect and promote a set of internationally mutual beliefs and understandings around the fundamental entitlements of children with disabilities. However, the social imaginaries (Jasanoff, 2015), narratives and cultural constructions (Hollos, 2002) surrounding the notions of 'childhood' and 'disability' differ widely and fundamentally around the world (Archard, 2014). Moreover, the evolution of such concepts throughout history has left a trail of 'models of disability' and 'concepts of childhood' which will inevitably continue to evolve in parallel to changes in society (Cooper, 2020). Such flexibility is likely to have a profound impact upon how these seemingly rigid conventions are interpreted and implemented, and how such notions are entangled, reflected, and preserved in the design of interventions for children with disabilities around the world (Brown, 2001). On a rudimentary level, the CRC and the CRPD offer roadmaps to realise children's most basic rights, but on a deeper level, they could be utilised as an opportunity to engage in constructive, creative, critical and vigorous debate, to challenge and stretch their very content, and to contemplate and reform what could be, and what should be (Hagan, 2020). Furthermore, several of the General Comments of the CRPD committee refer to

the need for professionals to engage in inclusive practices, which in this case could include better training for design professionals.

Introducing Design and 'Designerly Ways'

Design is widely recognised as an agent of physical embodiment, material culture and creative problem solving, through delivering physical products and services. However, when exploring the relationship of design with children's rights and disability, it is crucial to acknowledge the theoretical foundations and the wider contributions of the design field in its entirety. Relating to design mainly through the lens of 'applied and physical deliverables' not only compromises the full understanding of design as a discipline (including its theories, methodologies and processes), it also risks obscuring the broader interrelations and potentially significant contributions between the fields of design and children's rights on multiple levels.

Definitions, processes and outputs of 'design' vary substantially across different sectors and contexts, leaving no commonly agreed terminological foundation to explain or constrain it (Love, 2002). Design has thus become a consistent panacea to deal with all forms of communication, product, service, environment and system development (Buchanan, 2001), as well as to frame opportunities and solve problems from individual to global scales. The following reflections on the Design discipline interpret and portray certain 'designerly ways' (Cross, 2001) to help explain foundational terminology, introduce key concepts and clarify what is meant by the term 'design' in the context of this chapter.

Designerly Thinking and Design Thinking - One universal characteristic of design is the way professional designers think, referred to as 'designerly thinking'. These ways of thinking can be translated and exported for use by non-designers as an access point into the design field, referred to as 'design thinking' (Nhu Laursen and Møller Haase, 2019). Design thinking does not incorporate the methodological and theoretical aspects used by professional designers but it

conveys rather well the application of interconnected principles, practices, mindsets and techniques, which can be conceptually modeled as three distinct levels (Figure 1).
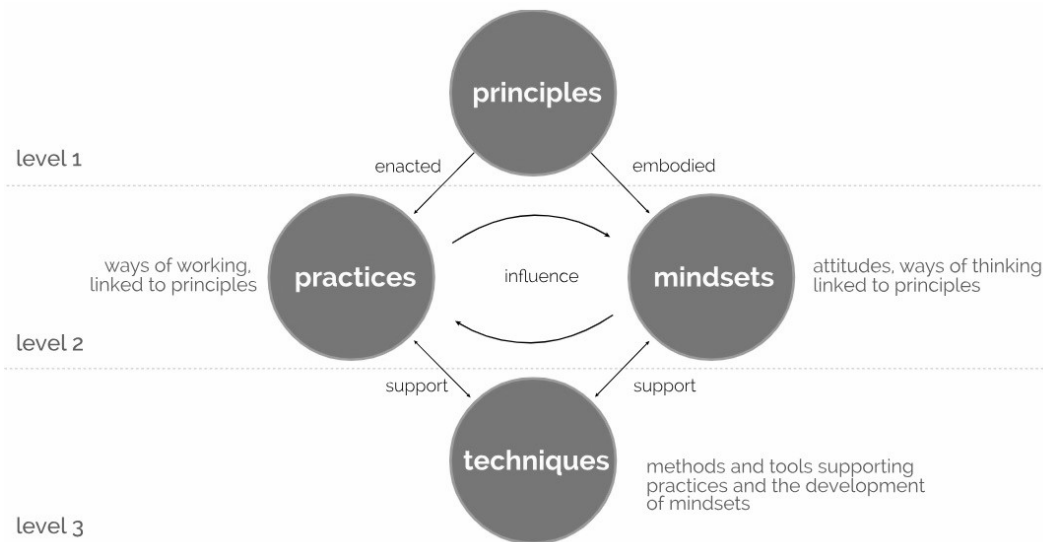
Figure 1. A Conceptual Model of Design Thinking (Carlgren et al., 2016).

Level 1 of this conceptual model contains the core 'Principles' of design (e.g. reflective framing, abductive reasoning, integrative thinking, holistic view), which are embodied by design 'Mindsets' (e.g. , empathic, experimental, explorative, optimistic) and enacted through design 'Practices' (e.g. divergent and convergent thinking, visualisation, thinking by doing, collaborative working). The combination of both Mindsets and Practices makes up level 2. Finally, level 3 contains 'Techniques', encompassing the methods and tools utilised by designers (e.g. ethnographic research, journey mapping, storyboarding) which support practice and further develop mindsets.

Design Process and Design Brief - One of the most commonly used terms in the discipline is 'design process', which can be described as the actions carried out within two distinct stages of 'framing' and 'solving'. The first stage of a design process focuses on framing to 'design the right thing', and the second stage focuses on solving to 'design the thing right' (Nessler, 2016). During

the earliest stage of the design process, designerly investigations take place as sensemaking or framing exercises (Dillon, 1982) to gather insights, better understand opportunities or problems and define the scope of the design task, often through a written technical document called a 'design brief'.

Design Contributions and Interventions - Outcomes of a design process could go beyond physical end-products; they include four categories of designerly contributions (Wobbrock and Kientz, 2016):

A. Interventional (e.g. products, services, systems)

B. Theoretical (e.g. models, frameworks, principles)

C. Methodological (e.g. methods, processes, techniques)

D. Empirical (e.g. ethnographic insights, analysis findings, data sets)

The category of interventional contributions can be further divided into the Four Orders of Design (Buchanan, 2001) which consist of: graphics; products; services; and systems. Figure 2 outlines the Four Orders and their relevant design disciplines.
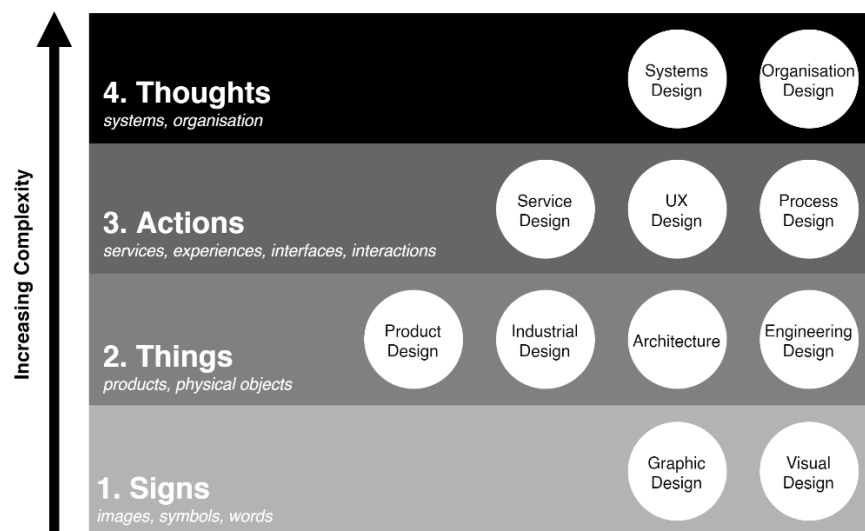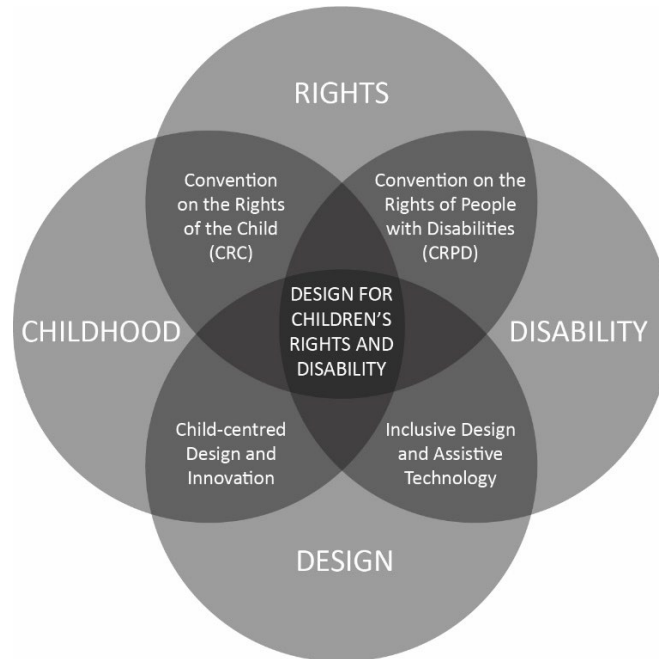

Figure 2. The Four Orders of Design and Relevant Design Disciplines.

There is huge potential to close the gap which exists between children with disabilities and their rights, by instigating collaboration and dialogue between the foundational knowledge domains of Childhood, Disability and Rights at the heart of the design process.

Figure 3. The relationship between Design and disabled children's Rights.

These core subject areas are each surrounded by a variety of deep-rooted disciplines of study and practice (Figure 3) containing a wealth of knowledge relevant to designing for the rights of children with disabilities. For example, in the field of Child-centred Design, organisations concerned specifically with design for children's rights have been established (5Rights Foundation, 2018; D4CR Association, 2018), whilst research hubs and higher education courses have been launched in the field of AT design and innovation (PPAT, 2018; Global Disability Innovation Hub, 2018). Despite this, little attention has been channeled into the specific pocket of knowledge at the intersection of these core subject areas, concerning design for children's rights and disability.

Disabled children's rights could manifest in relation to design on three key meta levels: design contributions (what is designed), design processes (how it is designed), and design investigations (why it is designed). In the context of design, disabled children's rights are often perceived as purely about methods and processes of participation and engagement (predominantly referring to Art. 12 of CRC, the right of the child to be heard) which means designers tend to focus on questions around participatory design processes and design for, with, and by children (Benton and Johnson, 2015; Can and İnalhan, 2017; Robbé, 2017). This risks other articles of the two treaties being neglected.

Although important and worthwhile, this focus on participatory methods has resulted in the current state of design for children with disabilities focusing on what and how we are designing, without asking crucial questions around why we are designing. Such limited designerly investigations have contributed to the deep-rooted issues around viability, feasibility and desirability of designs for disabled children (Heather et al., 2016; Holloway et al., 2018). To address these issues, the potential role of design as an active and direct agent of disabled children's rights is explored and questioned on multiple levels through investigating the intersection of knowledge from relevant fields. In terms of *why* to design, this chapter addresses the limited investigations into stakeholder narratives and social imaginaries (Jasanoff, 2015) in the design process. In terms of *how* to design, methods for capturing, understanding, and designing for the requirements and desires of a child are discussed. In terms of *what* to design, the field of inclusive paediatric mobility design is selected as a case study, to examine a range of existing contributions and shed light on the nature of designerly ways in the field. The chapter also explores questions around *who*, *where* and *when,* to highlight challenges and opportunities to optimise design as an agent of disabled children's rights.

Design as an Agent of Disabled Children's Rights

The 5 designerly ways from the Reflection-for-Transition Framework (Figure 4) are used as a reference point to structure exploration around how design could act as an agent acknowledging,

integrating and facilitating disabled children's rights. These closely intertwined designerly ways include: investigations, processes, contributions, collaborations and contexts (Shaw and Nickpour, 2021).
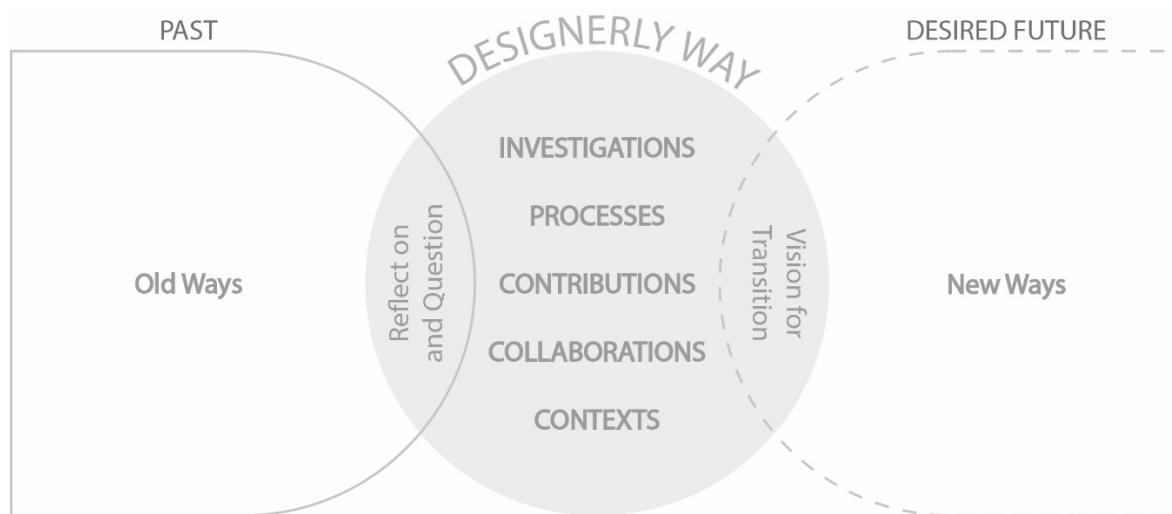

Figure 4. Reflection-for-Transition framework of Designerly Ways (Shaw & Nickpour, 2021).

Designerly Investigations; Asking Why?

There is always an intention, a cause, a motive, or a reason *why* we design. Whether designing out of duty (i.e. deontology), virtue (e.g. as an active citizen), utilitarianism (i.e. for the greater good), or freedom [from external forces], determining the scope of a design project is a critical ethical decision (D'Anjou, 2010), in which moral choices are confronted and a degree of design ethics is taken on, whether the designer is conscious of it or not. Designerly investigations are thus considered critical for ensuring design justice (Costanza-Chock, 2020). They are required to look at a subject from various points of view, taking into account a range of perspectives, narratives (Grimaldi et al., 2013) and social imaginaries (Jasanoff, 2015) to identify, question, and make sense of insights, before channeling them into a design brief with a clear set of expected outcomes and deliverables.

When instigating a process of social design for children with disabilities, open-ended and complex problems are often accompanied by a sense of urgency. The dogma and sense of authority emanated by conventions such as the CRC and CRPD convey a seemingly indisputable narrative that it is imperative to facilitate children's rights. As a result, designers often hastily accept this dominant narrative without conducting their own designerly investigations or taking time to consider the project scope on a deeper ethical level (Costanza-Chock, 2020). Failing to explore alternative narratives in this way limits the framing of *why* a project is needed and typically leads designers to focus on specifying *what* interventional solution should be designed, whilst sometimes also overlooking *how* children's rights can be embedded within designerly processes, or within technical design documents such as User Requirement Specifications (URS) and Product Design Specifications (PDS). To acknowledge, integrate and facilitate the rights of children with disabilities more fully in this early stage of design, the CRC and CRPD should be utilised by designers to inform and support their designerly investigations rather than to replace them.

Designerly Processes; Asking How?

In order to achieve a truly child-centred design process, the scoping and framing of a design project requires the participation of the child. Incorporating children's perspectives, requirements, and rights, centrally in the design process can elevate the status of their interests and views, psychologically and physically empower them, uncover unacknowledged, unstated and unmet narratives, requirements and desires, and achieve more appropriate and satisfactory child-centred outcomes (Benton and Johnson, 2015; Can and İnalhan, 2017; Robbé, 2017). Article 12 of the CRC explicitly states that 'the child who is capable of forming his or her own views has the right to express those views freely in all matters affecting the child', which includes their opinions, experiences and ideas around the design of interventions intended for their use. Children thus have the right to be recognised and involved as social actors and expert participants, and designers have the duty and privilege to pay attention and represent children and their views through participation in design and design research (Lomax, 2015).

Melton and Limber (1992) argue that the essence of Article 12 'goes beyond the right to be heard on individual matters to the right to voice opinions on matters affecting children as a class'. Lundy (2007) proposes four conceptual dimensions to the facilitation of Article 12 which design can adopt including: 'space' to create opportunities for children to express their views; 'voice' in terms of facilitating and capturing their views; 'audience' with regards to designers actively listening to children's voices; and 'influence' for designers to give children's voices and views due weight. Design is both well-positioned and well-equipped to accommodate these dimensions, through its multitude of empathic and participatory approaches and practices such as human-centred design, inclusive design, participatory design, co-design and co-creation, as well as its multiple creative and immersive methods and techniques such as cultural probes, design fiction, experience prototyping, storyboarding, role play, rapid prototyping, and creative workshops. Where a child cannot express their views without support, designers should remain cautious about the views and biases of other stakeholders becoming entangled and pushed forward as the child's own. To better facilitate children's rights, designerly processes should transition from asking *if* or *why* children should be included in the design process, to instead utilising guidelines, methodologies and resources about *how* best to engage with children from the outset, inclusive of children with alternative communication requirements (Ibrahim et al., 2021; Ellis, 2007; Hagen et al., 2012; 5Rights Foundation, 2018; D4CR Association, 2018), to ensure child-centred framing of the design project before rushing to identify requirements and solutions.

Designerly Contributions; Asking What?

Designerly contributions could be considered the most obvious agent of children's rights within design, as the physical deliverables which enable children to independently achieve their rights. Every choice made in design is a choice to include or exclude someone, affect their degree of independence, privacy, participation or access, and to enable or disable them; design could thereby be considered as the force responsible for causing disability (Shew, 2018). Designers thus have an ethical duty to consider the accessibility, functionality, and desirability of their contributions based on who or what they intend to include and enable. With regards to the accessibility of contributions,

one of the most significant barriers to children with disabilities accessing interventional designs is affordability (Holloway et al., 2018). The CRPD promotes the design and development of affordable AT (Art. 4) particularly in developing countries where cost presents a major access barrier to AT, and thus facilitation of rights.

As the role of designers and the very definition of design evolves over time, so too should the types of contribution being created, moving towards design being applied more evenly across products, services, environments and systems based on where it can achieve the greatest impact and facilitation of disabled children's rights. Furthermore, the theoretical and methodological design contributions could also act as powerful agents facilitating children's rights. This could also lead to design playing a major role in: the development of innovative and disruptive business models; a paradigm shift in the way AT is marketed and distributed; new policies, regulations, specifications and standards to promote greater inclusion for children with disabilities (Hagan, 2020).

Designerly Collaborations; Asking Who?

Designerly collaborations embody the ways designers engage with others throughout the design process, including who they work with and the nature of their engagement. Well-established practices such as co-design and participatory design enable designers to facilitate interdisciplinarity and foster co-creation by taking on the role as participant-facilitators (Aguirre et al., 2017). Beyond involving children with lived experience in the design process, the design of inclusive interventions for children with disabilities requires the interlacing of subject-specific knowledge from a wide range of disciplines. The specialist knowledge and experience of experts from disciplines with a strong child-centred focus, can help designers to focus on elevating children's perspectives, requirements, and rights whilst considering the risk of omitting particular aspects of children's participatory offerings. Interdisciplinarity provides a more holistic, rigorous

and exhaustive approach to child-centred design which ensures children's voices are deeply considered without disciplinary bias, and reduces risk of misinterpretation (Lomax, 2015).

Designerly Contexts; Asking Where and When?

Designerly contexts encompass the ways in which designers are influenced by factors connected with, or relevant to, the time, place and system they are designing for. Such influences present in a variety of forms, from deep-seated and imperceptibly evolving values, goals and interests at an individual level, to abrupt changes commanding immediate action at a global level, all of which contribute to the shaping of design outcomes. The contextual dimension of time ranges between thinking about the present and short-term solutions to the future and long-term solutions, whilst the contextual dimension of place ranges from the designer's personal or local context all the way up to an international or global context. Socially responsible design encourages designers to consider the ethical implications of constraining designs to specific places, and consider the needs of those beyond their own context (Tsekleves et al., 2021; De Vere and Melles, 2013). Techniques such as ethnographic research and usability testing help designers ensure design outcomes are suitable and feasible for the intended users and contexts, whilst open-source design advocates the sharing of knowledge (Aitamurto et al., 2015).

With regards to the temporal context of design, it would be short-sighted to assume that conventions formulated in 1990 (CRC) and 2007 (CRPD) will fulfil the requirements of children for the rest of time; there is always a need for revision, reform and innovation. Since these rights are just the baseline or 'minimum viable product' of what designers should be striving to facilitate, there is significant potential to uncover the unmet needs of children today and speculate how a better childhood could or should look for the children of tomorrow and forecast what their rights might look like. Contemplating and discussing speculative futures or alternative presents can be instigated by utilising approaches such as design fiction, future-gazing, reflective and critical design (Jakobsone, 2017).

Design for Paediatric Mobility Rights; Under the Spotlight

Paediatric Mobility as a Fundamental Right

Mobility is a necessary and profound part of life which amongst children in particular enables participation and access to a broad range of rights. Within the CRPD, Article 20 is titled 'Personal Mobility' and explicitly highlights the right to access quality mobility aids, devices and assistive technologies. During childhood, it is our ability to move about and independently explore our environment that provides meaningful access to almost all major areas of life including: physical, emotional, psychosocial, perceptual and cognitive development; play, recreational activities and social interactions with peers; active participation in the community and cultural life; self-reliance, self-expression and education (Guerette et al., 2013; Bray et al., 2020). Each of these areas are also considered as rights, embodied by articles 6, 13, 15, 23, 24, 28, 29 and 31 in the CRC and by articles 7, 10, 19, 20, 21, 24, 25, 26 and 30 in the CRPD. For children with mobility disabilities, access to these opportunities is greatly reduced and the likelihood of developing passive, dependent behaviours thus increases significantly. Lack of self-initiated mobility in early years limits children's ability to explore their environment which hinders the development of fundamental skills such as navigation and spatial-cognition (Anderson et al., 2013). Furthermore, around 90% of such brain development occurs during the first five years of life, making early intervention and provision of paediatric mobility an urgent priority to avoid irreversible developmental delays (Brown and Jernigan, 2012). Timely access to appropriate paediatric mobility interventions which facilitate independence can thus be deemed instrumental in facilitating the legal rights of children with mobility disabilities. The design of paediatric mobility interventions plays a significant role in determining to what extent these rights are facilitated. For this reason, the case study of paediatric mobility will be used in the remainder of this chapter to further interrogate and provide tangible examples of the interrelations of children's rights, disability and design.

The CRPD promotes the universal design approach as 'the design of products, environments, programmes and services to be usable by all people, to the greatest extent possible, without the need for adaptation or specialised design'. Within the global context of designing for children's rights and disability, we believe design can go one step further, and instead we put forward inclusive design as the best suited design approach, due to consideration of 'extreme users' (Newell, 2003) such as children or people with disabilities, being the centre of focus throughout the design process, as opposed to being a 'bolt-on' consideration. Building upon the human-centred and universal design approaches, inclusive design advocates for equity through firstly understanding the full diversity of people's physical and psychosocial abilities across different contexts, before focusing on a specific individual or use case, and then extending this to make design outcomes accessible and usable by the broadest possible population. This approach challenges the more traditional 'deficit oriented' approaches used to design for people with disabilities, which typically result in techno-ableist solutions that fail to meet the needs or desires of their intended users (Shew, 2018).

Inclusive Paediatric Mobility (IPM) design is the application of an inclusive design approach to create mobility interventions for children, such as wheelchairs, tricycles, standing frames, walking aids, prosthetic (robotic) limbs, braces and exoskeletons. Throughout history, the landscape of IPM design has responsively evolved to reflect advances in technology and changes in cultural narratives and understandings around childhood and disability (Butler, 2009). It is becoming increasingly important to approach the design process for such products from a child-centred point of view rather than simply downsizing adult mobility products (Heather et al., 2016). There are 3 conventional approaches towards the application of inclusive design which include the 'special-purpose' approach, the 'modular' approach, and the 'user-aware' approach (Clarkson & Coleman, 2015). In the context of IPM, the design of powered wheelchairs typically takes on the special-purpose approach which caters specifically for the needs of disabled individuals without extending to a 'mainstream' market. Adapted ride-on toy vehicles utilise the modular approach which customises mainstream products to cater for the needs of disabled individuals. Supportive go-karts

and other mainstream products which also consider the needs of disabled individuals during the design process embrace the user-aware approach.

Inclusive Paediatric Mobility Design from the perspective of Children's Rights

The following discussion reflects on the IPM design landscape using real-world examples to provide a snapshot of how design currently acts as an agent of children's rights and disability in the field, shedding light on the nature of designerly ways and exploring challenges and opportunities for the future.

Manifestation of Children's Rights Narratives in Design Briefs (Investigations)

Our interpretations of reality and the way we perceive problems are depicted through the narratives we embrace, which in the case of IPM design, often centre around equality and children's rights. For example, the narrative that 'children with mobility impairments should have equal development and participation opportunities to their peers' was what motivated a father in the UK to design an elevating power chair known as 'Turbo' for his disabled daughter (Everard, 1983). Similarly, the narrative that 'easy access to low-cost and customisable IPM interventions should be a right' led to the creation of a project called 'GoBabyGo' in the US, which uses a modular design approach to adapt ride-on toy vehicles for children with mobility impairments **(**Huang and Galloway, 2012). These narratives originate from contexts where the states parties officially recognise mobility as a right (Art. 20, CRPD), which highlights the lack of state initiative, funding and support to genuinely assure and facilitate this right. Engagement with alternative narratives and approaches to framing IPM have remained relatively underexplored over the past fifty years, resulting in a lack of substantial innovation or critical design in the field (Shaw and Nickpour, 2021). Extending designerly investigations to consider contemporary narratives around design justice, techno-ableism, empowerment and rights (Costanza-Chock, 2020; Fritsch et al., 2019; Shew, 2018) could help critique, alter, and reinvent the material-discursive landscape of IPM design, which highlights the need to engage with children and disciplines beyond Design at the front-end of the design process.

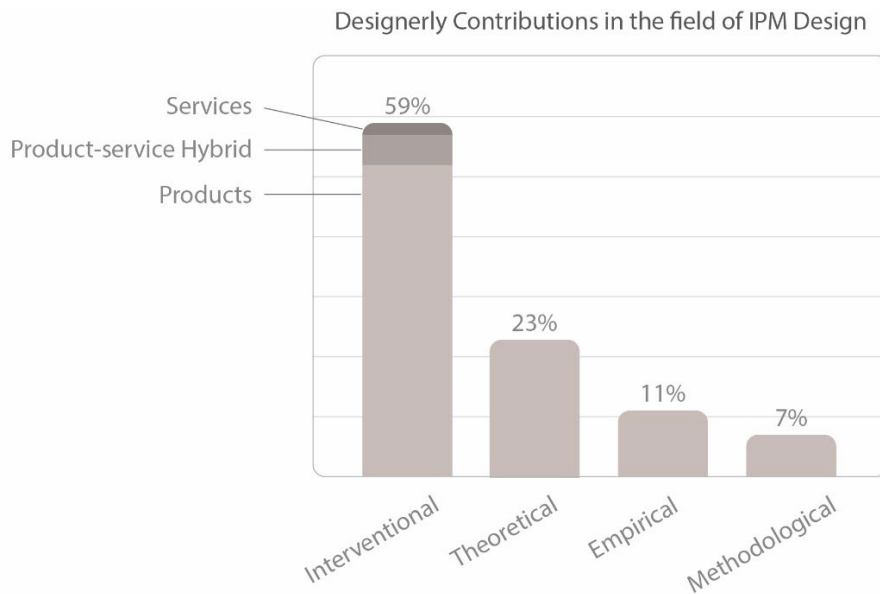*Child-centred Problem Framing and Solving (Processes)*

The multidisciplinary nature of the IPM field requires input from various stakeholders in the design process, which has often resulted in children's voices being diluted, repressed or excluded (Benton and Johnson, 2015; Heather et al., 2016). This is particularly visible when children's participation is facilitated alongside other stakeholders such as their parents, healthcare providers, or even designers, as power dynamics can influence the nature or weighting of their input (Gallagher, 2008). Meaningful participation of a child can be facilitated at various stages throughout the design process to understand and capture their requirements and desires, using methods such as participatory design, co-creation, design fiction, experience prototyping, storyboarding, role play, and creative workshop.

A case study which stands out for its commitment to child-centred design is that of an upright powered mobility aid which involved the participation of a child throughout its design, development and adaptation, over the course of nine years (Flodin, 2007). In this case, the child uniquely framed the design narrative around their self-image, independence and physical development, expressing a strong attraction to autonomous upright mobility early on in the design process. This in itself made a stark contrast to the typical seated posture wheelchairs which the child would have otherwise been prescribed. Another example of child-centred design comes from an exploratory project by Desmet and Dijkhuis (2003) to develop a wheelchair that has a more positive emotional impact for children. Through various studies involving both children who use a wheelchair and their parents, it was highlighted that the emotional responses, functional priorities and aesthetic desires of the children were considerably different to those of their parents.

Design as a facilitator of Inclusion or Exclusion (Contributions)

A recent illustrative mapping review of the IPM design field highlighted the disparity between designerly contribution types, as illustrated in Figure 5.

Designerly Contributions in the field of IPM Design

- Services
- Product-service Hybrid
- Products

59%

23%

11%

7%

Interventional   Theoretical   Empirical   Methodological

Figure 5. Imbalance of designerly contributions to the field of IPM design (Shaw & Nickpour, 2021).

The landscape of interventional contributions is shaped largely by an assortment of products, along with a scattering of services and product-service hybrids. Examples of such hybrid interventions include IPM product loan schemes intended to overcome financial accessibility barriers, including the Bugzi (QEF, 2018) and the Wizzybug (Designability, 2020) wheelchair loan schemes, however, it is important to acknowledge that such charitable initiatives are only necessary due to injustices resulting from state parties failing to uphold disabled children's rights (Sépulchre, 2020). In parallel, research around the relationship between inclusive mobility and legal rights, Ranchordás (2020) explains why access to affordable inclusive mobility that meets the user's needs should not be regarded as a separate socio-economic right, but as 'a concretisation of the right to equal treatment'. The idea of mobility as a service (MaaS) rather than as a product owned by an individual is an interesting example of how diversifying designerly contribution types could overcome exclusion and further support rights and equity.

It is worth noting that a large pool of dormant interventional design contributions exists in the IPM landscape in the form of design concepts or discontinued products. Learning from mainstream design, IPM interventions could remain relevant for longer by widening the diversity of users and geographic targets through designing flexible products which can adapt to people's changing needs

and changes in context. Adaptability and flexibility to cater for a child's growth and developmental needs are major factors to consider in IPM design, which often get overlooked and result in exclusion. An example of IPM design which directly addressed users' ever-changing requirements is the 'Evolvable walking aid' (Nickpour and O'Sullivan, 2016) which was designed to have 'Respect for the evolving capacities of children with disabilities' (Art. 3 of CRPD). Designing interventions to allow flexibility for changes in children's disabilities could offer them greater comfort and control over their mobility, whilst providing more viable, cost-effective and sustainable solutions.

Listening to Children through Interdisciplinary Participation (Collaborations)

Stakeholders and experts from different backgrounds and disciplines typically hold contradicting priorities, points of views and vested interests when it comes to IPM design, which leads to the need for trade-offs. Specific child-centred design methodologies can be adopted to strike a healthy tension between stakeholders and achieve trade-offs which work for everyone. Facilitating interdisciplinary collaboration which centres around the child's requirements, desires and aspirations is one way to achieve this. An example of this is the use of a theoretical framework which was developed to facilitate rigorous interdisciplinary analysis and interpretation of children's design inputs from a 'Dream wheelchair competition' (O'Sullivan et al., 2021) where children drew and/or wrote about their dream wheelchair design (example in Figure 6). The framework facilitated interdisciplinary discussion and collaboration to elicit children's voice and uncover their unspoken narratives, requirements and desired mobility futurescapes. Trending topics which emerged from the 130 analysed dream wheelchair designs ranged from incremental innovations such as safety features, weather protection and storage compartments, to more radical innovations such as futuristic technologies, the capacity to fly and magical powers. Many children expressed an altruistic desire for shared participation in their mobility experience through designing considerate accessories or features to engage with or empower their friends, parents or carers in ways that existing wheelchairs do not. Examples included a built-in tea making facility for mum, a passenger seat to travel together, a platform for others to keep up, and a machine to give toys to all the other children. These examples dismantle the rhetoric of dependency and establish children's desire for their future mobility interventions to facilitate child-initiated

socialisation. The child-centred insights elicited through such studies could be used as qualitative and quantitative data to guide and inform IPM designer's direction and decisions (Shaw et al., 2021). Although such collaboration and involvement of children could be considered as time-consuming and costly, the resulting child-centred design solutions will ultimately be more appropriate and serve their purpose better which from a rights perspective is an economic and moral investment worth arguing for.
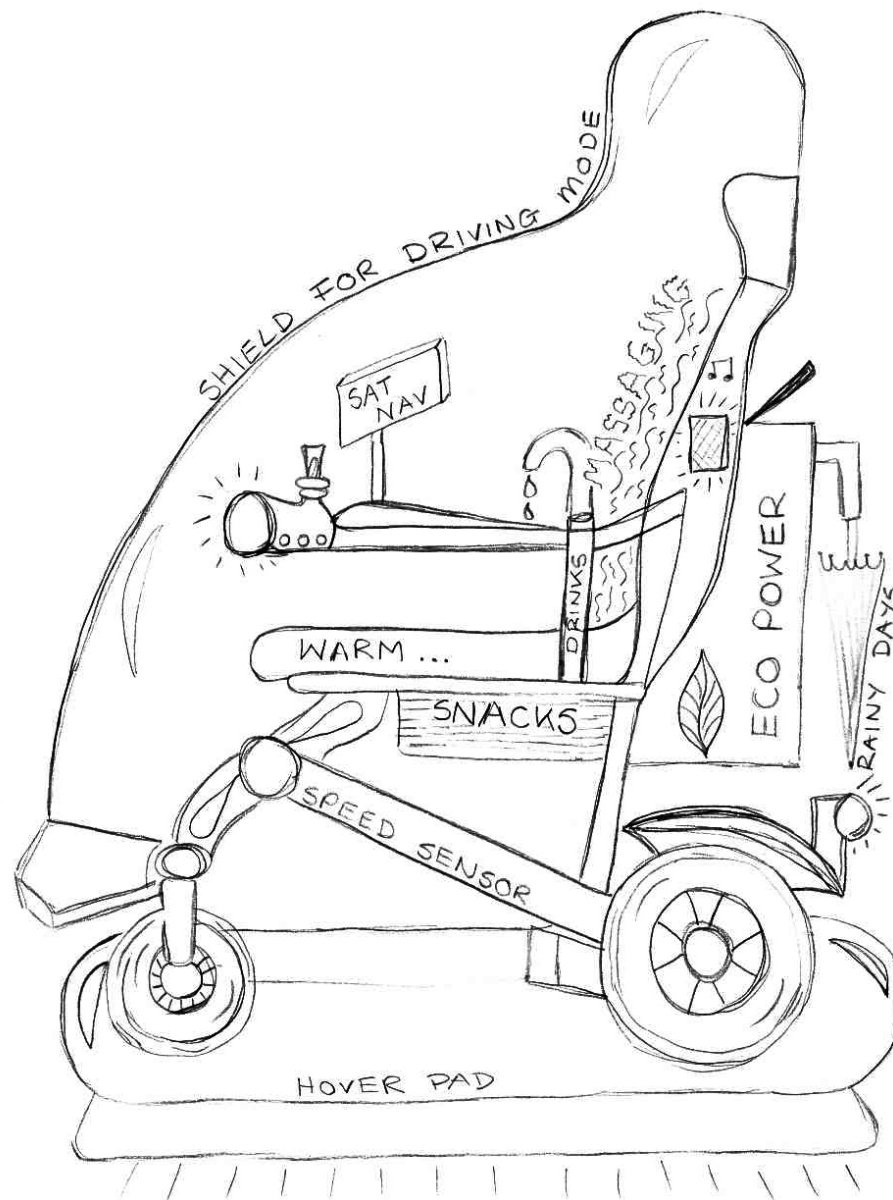

Figure 6. Example of a 'Dream Wheelchair' designed by a young wheelchair user.

Exploring the Bigger Picture of Children's Rights and IPM Design (Contexts)

When considering the designerly context of IPM design, it is important to acknowledge that over 80% of children in need of a mobility intervention live in low-resource settings which lack funding to cover such costs and lack access to appropriate and affordable devices (Holloway et al., 2018). Factors such as unaffordability, distribution limitations, and unsuitability of design for user or context, remain the leading barriers to accessing suitable IPM interventions. The CRPD demands State Parties to 'undertake and promote the development of affordable mobility aids' (Art. 4), and to share knowledge between and among states to minimise inequality (Art. 32), both of which rely on organisations or individual designers to fulfil. Consideration of the local culture, target user income, distribution models and long-term suitability for a given context are critical considerations when designing, implementing and sustaining affordable interventions, particularly in low-resource or developing regions of the world (Tsekleves et al., 2021). The all-terrain 'SafariSeat' wheelchair embraced three core design principles of 'affordability', 'localised design' and 'usability in context', to create a mobility aid which overcame many of the basic access barriers (O'Sullivan, 2021). The designers further championed accessibility and distributive justice by offering an open-source manual containing blueprints for the design, to share designerly knowledge across borders.

Optimising Design as an Agent of Children's Rights

Transitioning Designerly Ways

The following suggestions in Figure 7 summarise visions for transition for each of the five designerly ways to better acknowledge and embed children's rights in order to optimise Design as an agent of children's rights. Although based on insights from reviewing the field of IPM design, the high-level nature of these suggestions makes them pertinent and applicable to designerly ways in various neighbouring fields of design for children's rights and disability.
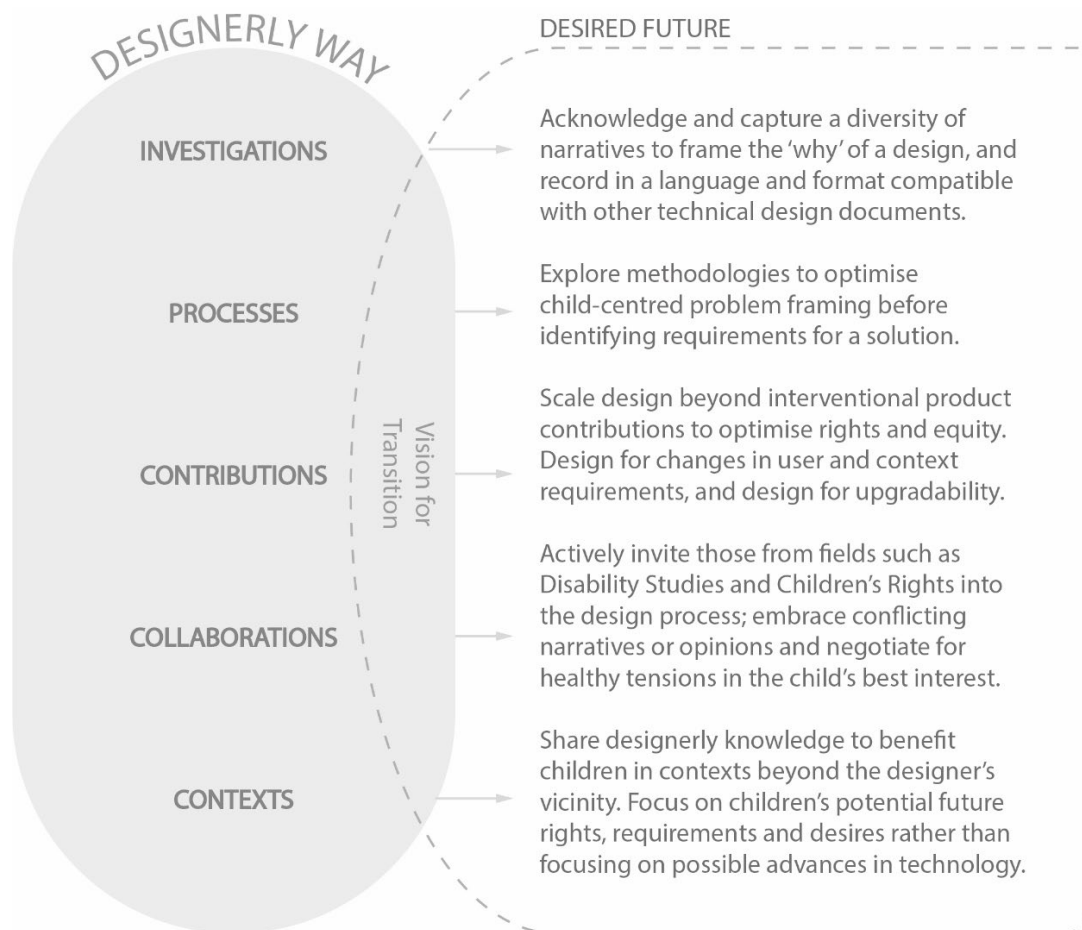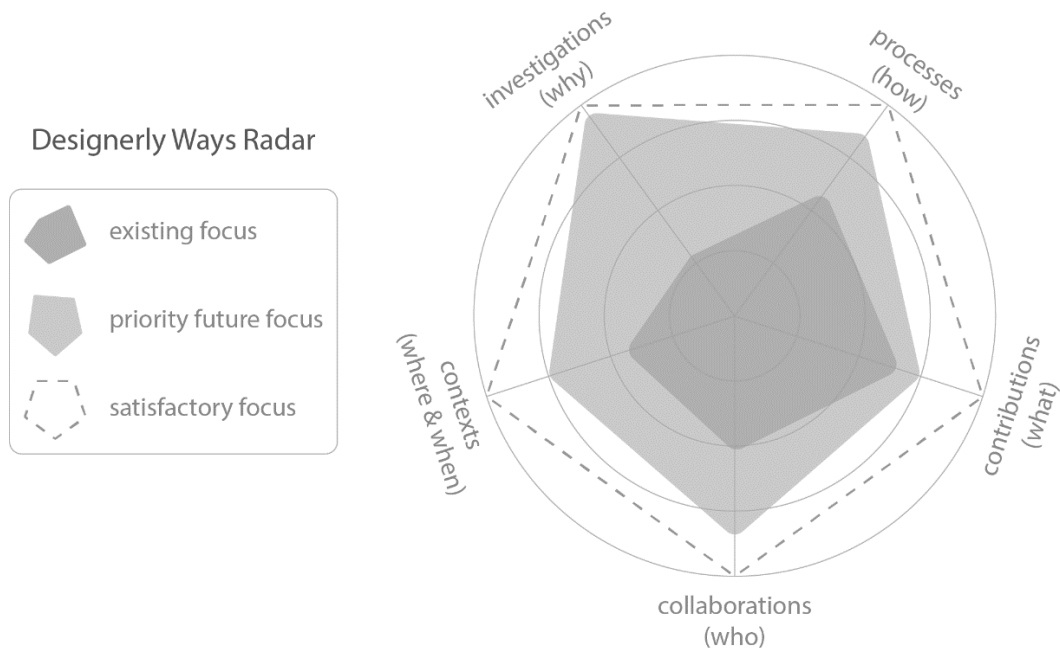
Figure 7. Transitioning designerly ways to optimise design as an agent of children's rights.

Prioritising and Balancing Designerly Ways

Having broadly reflected on how designerly ways can facilitate children's rights and suggested more specific opportunities to acknowledge and embed them, a macro perspective on designerly ways is now applied to identify precedence and priority for transitioning them. The radar chart in Figure 8 illustrates the distribution of IPM designers' attentiveness towards each of the designerly ways in the context of designing for the rights of children with disabilities.

Designerly Ways Radar

- existing focus
- priority future focus
- satisfactory focus

investigations (why)
processes (how)
contributions (what)
collaborations (who)
contexts (where & when)

Figure 8. IPM designers' collective focus on each of the five designerly ways in the context of IPM design as an agent of children's rights.

The dark coloured pentagon at the centre of the chart represents the existing focus designers give relative to each of the designerly ways, according to a review of literature in the field; it highlights the imbalanced levels of focus currently given to questions of why, how, what, who, where and when. The light coloured pentagon represents the suggested priority future focus to be given to each designerly ways, based on the goal of optimising design as an agent of children's rights, from the perspective of human-centred and inclusive design experts. Of the 5 designerly ways, 'investigations' bear the most significant influence over the entire design direction, approach, and outcome, yet currently receive the least focus; they have hence been prioritised as the area in need of most focus going forward. By starting the design process with questions of *why*, the project scope can be explored more rigorously on an ethical level to enable mindful consideration towards facilitating child-centred design and optimising the rights of children with disabilities. The interrelated nature of designerly ways means aspects of designerly processes, contributions, collaborations and contexts will naturally be entwined and improved with the heightened focus on designerly investigations.

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Conclusion

This chapter offers the foundational knowledge and tools required to support those advocating the rights of children with disabilities, to enter into discussion with the field of design, recognising its role as an active agent of children's rights. Firstly, five interrelated designerly ways are critically reflected upon and discussed to explore how design can act as an agent acknowledging, integrating and facilitating the rights of children with disabilities. These include Designerly: Investigations, Processes, Contributions, Collaborations, and Contexts. Secondly, Inclusive Paediatric Mobility (IPM) design field is focused upon and investigated in order to provide context-specific insights, challenges and opportunities surrounding designerly ways in practice. Finally, two key directions are proposed in order to help optimise design as an agent of children's rights, i.e. transitioning the designerly ways and prioritising and balancing the designerly ways.

Key insights for transitioning to alternative designerly ways are structured using the Reflection-for-Transition Framework of Designerly Ways (Figure 6). The current imbalanced focus on each designerly way and priority areas of focus in the future are outlined using a designerly way radar (Figure 7). Future design research around this topic should prioritise establishment of a more rigorous designerly investigations framing process which pays specific attention to capturing stakeholders' narratives and optimising the child-centred design approach. Going forward, incorporating reflective practice, there needs to be a framework for designers to objectively and robustly identify which of the designerly ways on the radar needs more focus from designers and why. Following this, there is a need to explore how any newly proposed designerly ways should be applied in the practice of design for children's rights. It is suggested that a commitment for equity and social responsibility should be instilled in designers of the future by incorporating topics such as social design, design justice and active citizenship into design education, and integrating designerly ways with engineering sciences.

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