Chapter 3 HUMAN-CENTRED DESIGN APPROACH

> These are ethical and political questions deserving of closer attention in future design studies. But these studies also need new kinds of researchers, able to understand complex technological issues certainly, but able to situate them in social practices. Articulate researchers that do not see the now clichéd distinction between practice-based work and more scientific and social scientific forms of design study. Researchers able to put the case for the design discipline and designerly ways of thinking as central to modern ways of working (Lloyd 2019:177).

Chapter 3 argues for the integration or seamless combination of scientific design research (designerly thinking) and practice-based design inquiry (design thinking) as a potential human-centred design (HCD) approach. As the quote above indicates, designers of today and of the future need to be equipped with skills and knowledge to engage with difficult and complex design scenarios that do not rely on distinctions between the different ways of operating in design. *She Ji: The Journal of Design, Economies, and Innovation* launched in 2015, is a peer reviewed, transdisciplinary journal at "the intersection of design, economics, and innovation in various combinations" that includes multiple perspectives, methodological frameworks as an interdisciplinary inquiry (Friedman et al in Friedman 2020:1). It includes papers addressing two streams that are distinct, but strongly related, as editors, Friedman et al (2020:1-2) explain:

> … design innovation in industry, business, non-profit services, and government by promoting a framework of economic and social value creation. Design in relation to social sciences … plays a key role in this area, as does design in relation to the arts and humanities …

And furthermore,

> … design-driven innovation to address complex systems bridging the social world and the technological world. In this regard, we examine design aided by perspectives from the sciences (Friedman et al 2020:1-2).

The *She Ji* journal has gained an audience that includes industry, business and government leaders, and scholars and scientists, within and outside of the design field. It aims to expand its reader and author profiles to include a growing number of professional designers, "[t]hese groups must work together if we are to generate robust design knowledge for the design profession and for the discipline as a unified field" (Friedman et al 2020:3). The journal aims to invite an active dialogue as an example of a recent scholarly initiative to bridge the historical gap between designerly thinking and design thinking that Lloyd (2019:177) warns should be addressed. Rittel and Webber (1973:1) already argued in the 1970s that "wicked" problems do not have "optimal solutions" as social problems are pluralistic and cannot be fully described, as compared to the "tame" problems of science. More than 45 years later, Dorst (2019:117) offers the same argument:

> Design might be limiting itself by approaching complex problem situations through a 'problem solving' perspective. In this article, a radically different approach is explored, which takes the complex nature of the problem situation as its starting point, and reframes the task of design as system transformation, rather than the creation of a solution (Dorst 2019:117).

Buchanan (1992:9-10) refers to four broad design areas, which contextualise the complexity of "wicked" problems by referring to "signs, things, actions and thoughts". This description refers to *"symbolic and visual communication"*, "*material objects"* and its complex relationships with people, "*activities and organised services"* and its experiential and connected scenarios of living, and lastly, "*complex systems or environments for living, working, playing, and learning"* that integrate sustainability, people, ecological and cultural environments (Buchanan 1992:10). He argues that these areas are interconnected and merge into design thinking, to become a "point to where design is headed in the future" (Buchanan 1992:10).

The fact that these concerns raised by seminal authors from the 1970s and 1990s are repeated by current authors and as a result, confirm the degree of complexity embedded in the indefinable and fluid challenges facing us in 2020, perhaps now more than ever. "The seeds of one possible future were about to be sown. 'You make it and you try it out' turns out to be a lot more complex than at first sight" (Lloyd 2019:178). Complex design challenges are transient and change over time. Lloyd (2019:167) furthermore identifies a "social turn" in the design disciplines, shifting from "an objective ('scientific') perspective to one more based on relativist approaches". Schön's (1983) constructivist approach to reflective practice and Alexander's (1964) contextual view on the nature of design and architecture support the shift in emphasis to a design understanding of meaning in context of people and the immediate environment. How do we train designers of the future, today? This is not a new question. Papanek (1984 / 2016) responds to this debate by contextualising the issue in an educational setting:

> *The main trouble with design schools seems to be that they teach too much design and not enough about the ecological, social, economic, and political environment in which design takes place*. It is impossible to teach anything *in vacuo*, least we have seen design to be. The problem with this dichotomy between the real world and the world of the school, there can be, understandably, many different answers (Papanek 1984/2016:291).

Spiller and Clear (2014:15) concurs and points out in their compilation of diverse projects and methods of architectural exploration that "[t]here is no prevailing orthodoxy, such as the old dogmas and doctrines of Modernism, not happily vanquished."

> Their days are full of thoughts about how to inject noise into the system, to precipitate change, and to find new ways of describing and communicating our evolving spatial conditions and new tactics for creating architectural space within them (Spiller & Clear 2014:13).

If spatial design education has made the shift to being responsive, agile, adaptable, then the "contingent forces of temporal flux" (Till 2009:115) embedded in human living scenarios becomes more prominent and the role and importance of the user is highlighted. In this light, a human-centred design approach is explored, and the potential value of empathy considered, deepening the understanding of complex design issues.

Background

Design thinking and designerly thinking

In order to discuss a human-centred design approach, the meaning and interpretation of two concepts, design thinking (DT) and designerly thinking (DℓT) are examined. The notion of human-centred design can be found in the literature and practice of DT (Norman 2013:219), as compared to DℓT (Cross 2006). DT has emerged as a methodology of design processes in business, management and innovation (Brown 2009, Hassi & Laakso 2011:54, Laursen & Haase 2019). Over the last 15 years DT has received much critique for having many shortcomings and limitations, and no empirical foundation and scientific value (Badke-Schaub, Roozenburg & Cardoso 2010:43). DT is also seen as an attempt to bring design practice into the business sphere, for people who are not designers by training or profession and is scolded as a superficial practice with the purpose of increasing revenue and creating a competitive advantage in business (Brown 2009, IDEO 2019, Laursen & Haase 2019: 814).

DℓT in contrast, is understood in the academic design community as a discipline of design practice and is founded in the writings of Archer (1965) and Simon (1969) as a systematic and scientific study and later Schön (1983) considering reflective practice. Human-centred design is not recognised as a methodological design approach in the academic DℓT discourse (Laursen & Haase 2019:821). However, research into DT practice reveals human-centred design as a way of "putting people first" as Brown (2009) explains that empathy becomes the fundamental principle of assuming someone else's view by "standing in their shoes" (Brown 2009:39, 49).

This investigation speculates on the potential synergy that exists between the two concepts of DT and DℓT to diffuse the academic debate that prioritises designerly thinking. By understanding both approaches in terms of its roots, purpose and values, the study of Laursen and Haase (2019), *The Shortcomings of design thinking when compared to designerly thinking* informs the points for consideration.

intermission

When I interacted with the designerly thinking literature and in writing this chapter, I did not feel a deep connection to the content, although the intent and purpose remain clear to me. What caught my attention was the almost invisible thread of the affective domain, lurking in the pages, waiting to be revealed. The words 'human-centred' appeared in Krippendorff's (2006) The Semantic Turn for the first time and in that moment, a smile found its way to my face. Similar to the engaging narrative of the resident and the supervisor in Schön's (1983) The Reflective Practitioner. I realised the potential for interrelatedness between designerly thinking and design thinking, strong and heavy –

Why the separate thoughts, why the guarding of boundaries, when a breathing membrane, instead, could enable a rich plethora of possibilities…

Origins

Below is an outline of the origins of both design thinking and designerly thinking to contextualise the literature review discussion in this chapter, from the perspective of a human-centred approach.

Design thinking (DT) origin

Design thinking has its origins in the inquiries into creative methods of the 1950s, which culminates in Arnold's (1958) *Creative Engineering* seminar on product development and innovation. Archer's (1965) *Systematic Methods for Designers* further expands the search into design thinking concerning methods and its relation to management. The focus of design thinking, as literature shows, is human-centred, immersed in context and dependent on social behaviour (Platner, Meinel & Leifer 2016:1-2). Wicked problems, as articulated by Rittel and Webber (1973:160) set the scene for business management to take a human-centred design approach to problems, within the constructivist approach in professional practice, explored at the time (Schön 1983).

McKim (1972) presents alternative methods, challenging stereotypical engineering processes. Kelley shares in an interview with Camacho (2016:90-91) that McKim was his mentor at Stanford and "championed 'needfinding', the idea that design thinking is human-centred, not technological or business-centred". Carleton & Leifer (2009) reflect on the Stanford ME310 course and its development since 1967, a radical course in engineering design that includes interdisciplinary work, practice partners and real-life problem-based learning. They identify the pedagogical evolution of the course over 40 years, culminating in 'foresight' from 2009 onwards, focusing on future scenarios for engineering design (Carleton & Leifer 2009). Kelley reflects on the impact of Arnold's pedagogical approach, as a psychologist, on creativity within the field of engineering,

> He would say, "You are in this world and it's underwater, and now design something that enables you to plant seeds understeer." You had to come out of yourself and out of your habits, because you had to design for a world that there was no way to experience yourself. That was his way of doing what we do now – which is to get rid of your habits, and look with new eyes, with a child's mind (Camacho 2016:91).

In 1978 Kelley establishes David Kelley Design and in 1991 founded IDEO, with the vision as a "global design company committed to creating positive impact" (IDEO - About 2019). Design thinking becomes part of business management and innovation, where service design takes the lead. In 2005 Kelley founds the d.school at Stanford, with a multidisciplinary focus shifting from (product) design to design thinking (Camacho 2016:92). The d.school Hasso Plattner Institute of Design at Stanford introduces design thinking as a process or methodology to people from all disciplines, not necessarily art or design.

> The reason for working on social problems is that if I want to teach students about design thinking as methodology, the best way to teach them is to give them a problem that they care about (Kelly in Camacho 2016:100).

Brown (2009:13) provides a platform for design thinking, by explaining its meaning as "more than a style", its focus on human needs, and considering methods, prototyping, experience and storytelling. In addition, he considers future scenarios, the social contract and design activism (Brown 2009:203). This

focus expands into other institutions of higher learning, for example the School of Design at the Carnegie Mellon University, where a 'design for interaction framework' outlines the holistic focus, 'design for service (existing design paradigms), 'design for social innovation' (challenging existing paradigms), and 'transition design' (proposing radically new paradigms) (Carnegie Melon Design n.d.). Buchanan's (1992) article, *Wicked Problems in Design Thinking*, as Head of Design at the time, promotes a holistic design focus. In addition, Design Thinking for Business Innovation at Aalto University's Executive Education is focused to influence creative practices in corporate environments:

> Design Thinking is an approach to innovation that is driven by deeper user understanding, early prototyping and iterative testing of the potential solutions. It is a practical methodology and process that guides the development of new, innovative products and services, processes, business models, and strategies (Aalto University – Executive education 2018).

Design thinking becomes a phenomenon appearing in business management and innovation during the 1980s (Johansson-Sköldberg et al 2013:122). An approach primarily addressing the needs and requirements of users or customers and according to the shared paradigm, has its roots in the design research developments of industrial design and product engineering (Cross 2006, Laursen & Haase 2019). Design thinking has been at the centre of attention in design research discourse due to the perception that it is a superficial approach that does not contribute to scholarly practices. As a result, an academic literature perspective claims design thinking is not credible compared to designerly thinking research (Johansson-Sköldberg et al 2013). In contrast, real-life projects in practice show positive change through rigour in design engagement in many practices around the world (Fern Tiger Associates 2013, IDEO 2019, Greater Good Studio 2019). The integrated discussion to follow outlines what design thinking is considered to be in practice, how it aims and intends to make change in the design profession.

Designerly thinking (Dℓ T) origin

Designerly thinking (DℓT) has its origin in design research of the 1960s in the United Kingdom with the founding of the Design Research Society in 1966. The 1962 *Conference on Systematic and Intuitive Methods in Engineering, Industrial Design, Architecture and Communications* (London) responded to new conditions influencing design post World War II with "social dependence on designed industrial goods" and by removing the disciplinary boundaries in design fields (Crouch & Pearce 2012:17). As a scientific search *in* design research, Bruce Archer (1965) investigates in his PhD thesis the methods of design as a systematic practice of "ontology as a discipline" (Davis & Gristwood 2016:1, 5). The focus of his investigation is to understand the "nature of design as well as finding better ways of designing" (Davis & Gristwood 2016:2). Further background (Simon 1969) and rival positions (Alexander 1964; Jones 1970) to this development are included in *Chapter 2*, which also contextualises this discussion.

Design paradigm

Shared paradigm of DℓT and DT

The collective paradigm of a research community guides the methodological approaches, which is informed by the way presumptions shape a community's view towards situations, people and objects (Laursen & Haase 2019:816). Paradigms are not static, but change over time and are informed by "conception of reality"; "beliefs about the objects/subjects they study"; "scientific ideals"; and "ethics and aesthetics" (Abnor & Bjerke in Laursen & Haase 2019:817).

In order to contextualise the understanding of theoretical paradigms, a Philips Design paper, titled *Rethinking value in a changing landscape: a model for strategic reflection and business transformation* outlines the evolution of value by identifying four value paradigms: industrial paradigm (1950s); experience paradigm (1980s), knowledge paradigm (unfolding); and transformation paradigm (future) (Brand & Rocchi 2011). The model reports on people and business perspectives that are 'unfolding' to 'future' values that shift from 'self-actualisation' to 'meaningful living' (people mind set) and from 'enabling creativity' to 'value networks' (business mind set) (Brand & Rocchi 2011:6). The importance of noting value paradigms relate to its influence on the way we live and work, and the transformation of theoretical paradigms. Laurson and Haase (2019:820-821) posit that DT and DℓT have a shared paradigm, consisting of three aspects: wicked problems, abductive reasoning and contextual meaning.

Wicked problems

> The kind of problems that planners deal with – societal problems – are inherently different from the problems that scientists and perhaps some classes of engineers deal with. Planning problems are inherently wicked.
>
> As distinguished from problems in the natural science, which are definable and separable and may have solutions that are findable, the problems of governmental planning – especially those of social or political planning – are ill-defined; and they rely upon elusive political judgment for resolution. (Not "solution." Social problems are never solved. At best they are only resolved – over and over again.) (Rittel & Webber 1973:160).

The social context shapes the manifestation of wicked problems due to the plurality and heterogeneity in society. Rittel and Webber (1973:167) further point out that industrial economies were differentiated culturally, with greater differentiation expected in the post-industrial society. Brand and Rocchi (2011:16-17) state that the current knowledge economy (self-actualisation and enabling platforms) was preceded by the experience and industrial economies. They propose a future transformation economy, of emergent value networks that consider global vision and local impact through meaningful living, founded on systemic and transformative thinking, empathy, cooperation and collective issues (Brand & Rocchi 2011:17, 24). Considering this future context, wicked problems are becoming more complex, however, Rittel and Webber's (1973:161-167) ten properties of wicked problems are still relevant. Cross (2006:7) supports the notion regarding ill-defined problems and states that "[t]hey are therefore not susceptible to exhaustive analysis, and there can never be a guarantee that 'correct' solutions can be found for them."

Dorst (2019:118) argues for design to "adapt and change to stay in tune with its new role in its new environment" as new issues emerge because of applying design practices within unfamiliar design contexts. Buchanan (1992:15) refers to the relation between *determinacy* and *indeterminacy* regarding wicked problems and assigns a "linear model of design thinking" to the former. Dorst's (2019:117) proposition of "design as system transformation, rather than the creation of a solution", is considered in relation to the latter. This study supports the systems approach and speculates that by using hybrid methods in the design studio, deeper insights and understanding can emerge that are scenario based and pluralistic in expression instead of presenting products or solutions.

Abductive reasoning

Peirce (1903) introduced the concepts of abduction, deduction and induction. "[A]bductive reasoning allows one to conceive ideas from vague, possible or potentially possible phenomena" (Mirza et al 2014:1982) and as "propositions or qualified 'guesses' that need to be empirically tested", or as "propositions of potential futures…" (Laursen & Haase 2019:820, 822). The understanding and application of abductive reasoning is considered not only in a design context, but also in the health sciences. Mirza et al (2014:1980-1981) note key findings that abductive reasoning requires a "complex or puzzling situation and a clinician [designer] who possesses creativity, experience and knowledge" and furthermore "…results in the formation of broad hypotheses [speculation], which lead to an enhanced understanding of care [design] situation." Abductive reasoning surfaces different ways of knowing and assists practitioners to develop a "broader and deeper understanding of the care [design] situation" (Mirza et al 2014:1980-1981). It is noteworthy that ill-defined problems, in various contexts, can benefit from reasoning in this way. Although Peirce's abductive reasoning has received criticism regarding its 'logic' and 'perceptive elements' responsible for the development of "new ideas" (Hoffmann 1999:271), this study does not pursue this critique any further, in order to focus on the topic of investigation.

Abduction can also be considered an alternative action, "starting from the only known in the equation, the desired value, and the adopting or proposing a new how" (Dorst 2019:119-120). Propositions therefore become 'placeholders' for responses to the intangible and complex issues that are not yet defined. Buchanan (1992:12) refers to *placements*, as "rich, diverse and changing".

> Placements have boundaries to shape and constrain meaning, but are not rigidly fixed and determinate. The boundary of a placement gives context or orientation to thinking, but the application to a specific situation can generate new perception of that situation and, hence, a now possibility to be tested. Therefore, placements are sources of new ideas and possibilities when applied to problems in concrete circumstances (Buchanan 1992:13).

As a warning, Buchanan (1992:13) expresses caution when designers start to use "conceptual placements" as "categories of thinking" and explains that categories have fixed meanings. Design responses can then no longer be fluid and adaptable, but become superficial and predictable. Abductive reasoning therefore relates to appreciative inquiry (Stein et al n.d.) where the process searches for particular contextual opportunity and potential.

Dorst (2019:119-120) refers to design reasoning, or "design abduction", where the only known aspect is the "desired value" as outcome and the challenge to determine the elements required to reach that value. These elements include both the *what* and the *how*, to be developed in parallel, as a "double creative step" for developing proposals (Dorst 2019:120). This notion relates directly to the concepts 'dialogue with the situation' and 'co-development of problem-solution' (Cross 2006). Dorst (2019:119) relates this complexity to situations in the human domain, where the user is not always specified, and often does not represent a single user profile. Therefore, abductive reasoning is context and situation specific.

Contextual meaning

Krippendorff (2006) considers contextual meaning in artefacts by investigating the cultural aspects influencing the philosophical and semantic considerations relating to industrial / product design by saying that "…'design is a sense creating activity'…" related to an objective-subjective distinction (Krippendorff 2006:xiii). He presents four theories outlining how artifacts make sense in a given context, 1) the use of the artefact itself, 2) artefacts and their meanings in language, 3) the meaning of the lives of artefacts, and 4) the ecology of artefacts and their meanings. Moving from the micro or object based, to considering the context of a macro, or ecological scale, they appear similar to the four orders of Buchanan (1992:9-10) that are also multi scalar:

> But the "human terms" that people bring to how they connect artifacts pertains to a highly localized understanding. This understanding does not embrace the whole ecology, and it is not generalizable to it. It is distributed, not shared. Whereas ecologies of biological species result from the multiplicity of local interactions between the organisms of different species, ecologies of artifacts result from enacting the multiplicity of local ecological understandings (Krippendorff 2006:195).

The act of "human involvement" brings meaning to how artifacts relate to one another when in use, and are conceived by users (Krippendorff 2006:193). This is a dynamic process, which is unpredictable. Contextual meaning is therefore also related to spatial design, considering Krippendorff's (2006) explanation and motivation for sense-making of artifacts. The relation to spaces for human occupation are included into this discourse, by considering agency and contingency (Awan et al 2011, Till 2009). This study therefore argues that contextual meaning is not only related to what things mean in their context, but also integrated to the how, or the action of understanding by the designer, through 'explicit knowledge', or by 'tacit knowing' (Polanyi 1966). This relation to knowledge and how we assign meaning, lies in memory and Norman (2013:97-98) explains this by giving two categories: "[m]emory of arbitrary things … with no particular relationship", and "[m]emory of meaningful things … with meaningful relationships" (Norman 2013:98). Krippendorff & Butter (2007:2) argue that meanings are not universal, and that personal interpretation is integral to its richness: "we must be clear about whose meaning we are talking of and allow for the possibility that we may see things differently."

Meaning-making is not only considered in terms of objects and environments, but is interpersonal. Wildevuur et al (2013) relate meaning to an aging population where the intangible side to meaning-making is highlighted by considering exchanges, expectations and encounters between people. This

understanding of meaning in a social context reveals another dimension – emotional attachment – that becomes relevant to all people. Contextual meaning, includes not only man-made spaces and things, but is constituted firstly from human interaction and the relatedness and emotional attachment we form (Wildevuur et al 2013:70). However, this is not exclusively the case for attachment to people, as Norman (2013:98) illustrates. Meaningful relationships can also be with things.

Krippendorff (2006:213) outlines “methods for creating spaces for possible futures” by describing and giving examples of design methods as a science for design. It is noteworthy to mention that the focus for Krippendorf (2006:214) is on peoples’ needs and perspectives first as a human centred action, an aspect of contextual meaning and interface that is foremost emphasised as a prerequisite for meaning-making. This is echoed in other DT writings, as a human-centred approach (Brown 2009; Norman 2013), which however, is not the case for DℓT literature (Laursen & Haase 2019), expressing an academic approach, instead.

Mini-summary

The investigation into the shared paradigm for DℓT and DT contextualises the theoretical framework to allow for a deeper exploration as an integrated discussion of the two methodological approaches. The connections between wicked problems, abductive reasoning and contextual meaning, signifies the potential and importance of personal growth of a designer. The increased complexity contained in wicked problems, requires designers to apply different skills in challenging projects, which implies personal transformation aligning with resilience, responsiveness and adaptability. As a result, designers should be able to absorb ambiguity and uncertainty at different stages of a project and be comfortable to work within vague and often undefined boundaries. Abductive reasoning and ‘qualified guesses’ or grounded assumptions within projects, introduce the concepts of judgement and values. When a project is focused on proposing scenarios and possibilities, instead of creating a solution, designers are required to look beyond the product as an outcome and embrace integrating and considering people.

Considering contextual meaning, the understanding of meaning of physical objects in real contexts inform a spatial cognition. However, the intangible side to meaning-making, brings a deeper side to people-object-environment interface. The value of social interaction and its subsequent emotional connections should be recognised in spatial design, as this elusive dimension links us emotionally. Therefore, human-centred design is the driver for in-depth analysis, as informed by academic sources and accounts from practice, as research articles and conference papers, where practitioners and educators share hands-on experiences. It is expanded by personal discussions with practitioners in the field.

Design methodologies

The section below introduces the disciplinary discourse regarding design thinking and designerly thinking, by outlining strengths and rival opinions in the literature, followed by an integrated discussion.

Design thinking (DT) methodology

In a comprehensive article, Laursen and Haase (2019:825) refer to Arbnor and Bjerke's (1997) methodological approach requirement to be located in a 'problem situation'. They claim in their literature focused inquiry that design thinking is mostly described by 'suggested actions' (phase models, perspectives and organization), instead of methodological approaches (explorative learning) (Laursen & Haase 2019:821, 824-825). Furthermore, DT methodology does not provide guidance on the selection and use of tools and techniques related to complex issues and the context of application (Abnor & Bjerke in Laursen & Haase 2019:825). Another literature based study, comparing designerly thinking and design thinking (Johansson-Sköldberg et al 2013), conclude that the meaning of design thinking is dependent on the context and focused on creativity and innovation with a popular character, which is considered superficial as compared to designerly thinking's long academic history (Johansson-Sköldberg et al 2013:121).

In contrast to academic literature studies, investigations into practice-based inquiries reveal a different picture. Extensive research into the practice of design thinking has emerged over the last ten years, where authors investigate the theoretical framework and methodological approaches. Vaugh and Ryan (2015) report on a study where 18 industry projects using a structured design thinking process was followed. They used Klein's (2013) triple insight model to "identify, measure and describe the assumption shifts throughout the design thinking process over five business model dimensions." These dimensions are paired with related tools recommended for use in each of the five phases (Vaugh & Ryan 2015: 15). Camacho (2015) explores a model for DT in order to determine its effectiveness across disciplinary boundaries and to determine a design thinking practice. In a follow up study, Camacho (2018:627, 631) presents evidence from twelve global experts regarding a "synthesis of commonalities and variations among effective approaches of design thinking" as a model for design thinking. In addition, her investigation provides "principles underlying current methods and tools, and integrating complementary aspects from different approaches into an overarching view of design thinking" (Camacho 2018:627). The model outlines fundamental principles (system-orientated, human-centred and creation-based), and specifically assigns action principles and process / dynamics principles to the former (Camacho 2018:631), which provides evidence for design thinking methodology. This shows the rigour and depth in methodological approaches, which warrants these to be considered more than 'suggested actions'.

Contrary to Laursen and Haase's (2019:825) findings, highlighting the shortcomings of DT methodological approaches, this discussion includes a practice based inquiry to reveal phased models, perspectives, empathy and collaboration as methodological 'ways of knowing' for design thinking. In addition, the big divide that both sides claim, is not as vast when taking into account designerly thinking's

evolution from a rationalist to a constructivist approach (Dorst 2019) and in the light of design thinking's rigorous methodology in the field. Examples from practice reveal that design thinking has thorough ways of engagement in research activities to better understand people and situations (Martin & Hanington 2012). The history and origin of each is bounded in a different context, but this investigation shows a move towards a common goal, by embracing differences, in favour of the greater good.

An example from the Greater Good Studio's Academy for Global Citizenship (2020), dealing with lunchtime at school is used in the discussion below. "We want kids in the cafeteria to eat healthy and waste less" (The Greater Good Studio 2019). Sara Cantor Aye presents this case study at the IxD13 Interaction Design Conference, *Social Innovation with Impact* (Greater Good Studio's Academy for Global Citizenship 2020).

Designerly thinking (DℓT) methodology

Designerly thinking's methodological approach is framed by its theoretical perspectives, which Johansson-Sköldberg et al (2013:124) identify as the *creation of artefacts*, *reflexive practice*, a *problem-solving activity*, a *way of reasoning / making sense of things*, and the *creation of meaning*. This investigation acknowledges the theoretical foundation of this academic discourse, but speculates about the value of focusing on the creation of artefacts as objects or solutions and the emphasis on problem solving.

This section considers the methodological aspects of designerly thinking, reflective practice, framing, co-development of problem and solution, dialogue with the situation, solution-led goal analysis and modal shifts (Laursen & Haase 2019:820). The application is illustrated with an example from Schön (1983:109-127) related to mental health sciences, demonstrating the similarities in level of complexity and difficulty in describing and dealing with ill-defined problems, comparable to examples of spatial design. Schön (1983:109) describes the scenario unfolding between a third year resident in psychiatry and his supervisor regarding the situation of a returning patient. Schön (1983:79-104) also includes a reflective conversation from architecture, however, the psychiatry example demonstrates the concepts from the perspective of an unrelated field to deepen its understanding.

Integrated methodology

The structure to follow challenges the separate theoretical frameworks as outlined by Laursen and Haase (2019). It speculates through an integrated narrative of design thinking and designerly thinking, the possibility of a human-centred approach (Table 3-1). Opposing debates are included to provide a holistic overview of the discussion and to consider the relation to spatial design education.

Table 3-1: Integrated methodological structure (expanded from Laursen & Haase 2019:820-821)

Designerly thinking (DℓT)		Touchpoints	Design thinking (DT)
		Methodological approaches	
Reflective practice	**6**	**Critical reflection** Designer's worldview, mind sets User's reality, context, behaviour	Exploratory learning (reflective practice)
Framing	**2**	**Project / scenario framing** Situational, contextual, meaning Understanding and insight	Phase models [framing]
Co-development of problem-solution	**5**	**Scenario exploration** Open-ended, possible scenarios, provoking and engaging, stakeholders	Phase models
Dialogue with the situation	**4**	**Dialogue with the situation** Scenario frame and possibilities, collaborative, real-time, transaction	Exploratory learning
Solution-led goal analysis	**3**	**Situation-led potential analysis** Agency, contingency, responsive, resilient, systems-based	Perspectives and empathy [user needs and requirements]
Modal shifts	**1**	**Perspectives and modal shifts** Empathetic knowing Shifts – process and activities, people, 'frame of reference', issues	Perspectives and empathy
		Tools and techniques	
Tools and methods		**Collective tools and methods** Amalgamation of academic and human-centred tools and methods	Tools and methods

1_Perspectives and modal shifts

Perspectives and modal shifts are positioned at the start of this section, as it contextualises the other methodological approaches. It deals with two aspects, firstly modes of design engagement and secondly, shifts in perspectives in order to understand projects better.

Modal shifts (DℓT)

MODES OF ENGAGEMENT (DℓT). Cross (2006:88) explains modal shifts as part of process strategies, in which "designers alternate rapidly in shifts of attention between different aspects of their tasks, or between different modes of activity". He refers to three studies where researchers documented the design activities of students (Akin & Lin, Atman et al, Cross in Cross 2006:88-89). Findings suggest that a quick alternation between activity modes enable students to increase the creativity of work, or the quality of overall design concepts. Furthermore, students with a fluid transition between different modes of activity, "gathering information, sketching and reflecting", completed projects with success (Cross 2006:89). Till (2009:113) adds another dimension to shifting between activities of inquiry, by introducing the "temporal condition" and its representation. In this way, a deeper level of understanding is reached. Forester (1985:17) refers to "sense-making" when he points to:

> Speech or gesture or line or sketch wholly in the abstract would be meaningless, but the metaphor of design as sense-making via conversation situates the designer's work in a historical, practical context (Forester 1985:17).

Organization (DT)

COLLABORATION (DT). Through conversation and collaboration, modal shifts are facilitated during a design thinking process through multi-disciplinary teamwork, co-creation and human-centred design (Laursen & Haase 2019: 825). Camacho's (2018) integrative model of design thinking includes organization in its three fundamental principles. Firstly, system orientated, considering future conditions of people on a strategic level through small incremental changes (Camacho 2018:632-633). Secondly, as human-centred, considering human needs integral to a systemic impact on lives. In order to gain a deeper understanding, various perspectives of situated problems are obtained by workgroups (Camacho 2018:634-635). Thirdly, as creation based which incorporates interaction and various role players to envision and test future possibilities. These are created in shared spaces of innovation where various tools and techniques are used to explore, probe, and develop ideas (Camacho 2018:635-637).

MEANING (DT). Krippendorff (2006:26) reflects on the idea of meaning from the perspective of "possible futures", the designer on behalf of the user. How can this be achieved without an understanding of someone else's reality, experiences, and dreams? The relation to normative dissociation and the ability to alternate between personas (Butler 2006, Panero et al 2019) in *Chapter 2* is noted, by shifting between perspectives of designer and user, to comprehend the frame, full scope and possible goals of a project setting. Modal shifts also include imagining different or unfamiliar contexts in order to increase the designer's contextual awareness and situated meanings (Panero et al 2019). In support, Johansson-Sköldberg et al (2013:132) emphasise a pluralistic perspective within designerly thinking, to support a social constructivist approach to design engagement, which relates to different perspectives and experiences.

Perspectives and empathy (DT)

EMPATHY (DT). Brown (2009:49) expresses the integral need for empathy in design thinking and uses the phrase, "empathy: standing in the shoes (or lying on the gurneys) of others". This statement relates to normative dissociation (Butler 2006) as a way for designers to deliberately place themselves in the situation of the user.

> We build these bridges of insight through empathy, the effort to see the world through the eyes of others, understand the world through their experiences, and feel the world through their emotions. […] We have all had those kinds of first-person, first-time experiences … In these situations we look at everything with a much higher level of acuity because nothing is familiar and we have not fallen into the routines that make daily life manageable (Brown 2009:50-51).

The notion of empathy has received criticism in design discourse for its limits in effectiveness and usefulness. Heylighen and Dong (2019) present an in-depth study and report on the ethical considerations of empathy and developing empathy as a process. They reference a number of studies that consider empathy as "a way for designers to gain insight into user's experiences, needs, and desires", in the landmark study of Patricia Moore (1979-1982) that motivates for the inclusion of empathy in design to address emotional needs (Heylighen & Dong 2019:108). In other studies a decade

later, they propose empathy to become an approach or “a way of thinking” (Heylighen & Dong 2019:108).

Literature outside the design discourse considers empathy as abstract concepts: cognitive, affective or a combination of the two. Cuff et al (2014:147) define cognitive empathy as the “ability to understand another’s feelings related closely to theory of mind” (after Blaire 2005) and affective empathy as “the experience of emotion, elicited by an emotional stimulus”. The debate continues whether empathy can be recognised only in an emotional context, and if cognitive empathy alone can be considered as ‘empathy’ (Cuff et al 2014:147). Another view on empathy, offered by health sciences’ psychiatric practice, brings another understanding (Ross & Watling 2017:28) by identifying three components within an empathetic continuum: relational empathy (understanding of patient’s perspective and experience to surface meanings), transactional empathy (negotiation and shared subjective understandings) and instrumental empathy (skilful navigation from problem situation to solution space). The psychiatrist becomes instrumental in the relationship treatment, and an empathetic understanding becomes instrumental to the outcome of the treatment through an engaged interaction (Ross & Watling 2017:29-30).

The relation between the psychiatric empathy triad and a design perspective reveals similarities in the understanding of empathy beyond abstract concepts. Although it might seem like a superficial comparison by replacing patient with user and psychiatrist with designer, a well-rounded design scenario is represented. By considering empathy as a continuum that leads to understanding, negotiation and future action proves useful in the discussion of design thinking that aims to make positive change in the lives of everyday users.

PHASES OF EMPATHY (DT). Kouprie and Visser (2009:439-440) present empathetic techniques based on imagination to simulate user scenarios. Furthermore, they propose a four phase framework for application in design situations addressing the different perspectives a designer adopts during the design process. Firstly, ‘discovery’ (designer enters the user’s word with curiosity). Secondly, ‘immersion’ (spending time in the user’s world to expand own frame of reference). Thirdly, ‘connection’ (designer relates directly to the user on an emotional level and constructs meaning and understanding). And fourthly, ‘detachment’ (designer exits the user’s world with a new perspective) (Kouprie & Visser 2009:445). The empathy process reveals modal shifts, where the designer steps outside the mind of a designer and transposes into the world of the user, in order to develop an understanding of various perspectives, as an explicit act, shifting between roles. Kouprie and Visser (2009:446) suggest various tools and techniques for this process, but warn that the empathy process is timeous and that sufficient time should be assigned to the ‘immersion’ phase.

> This phase takes time to wander around in and be surprised by various aspects of the user’s world. This phase requires time. Without this phase, the knowledge about the user’s world will not increase. In design practice, this phase is often not given sufficient time. Designers can be reluctant to immerse themselves, as this activity is not directly solution focused and therefore the activity may not be perceived as relevant beforehand. By explicitly having

> the task to wander around, to immerse, without making judgements and implementations the designer becomes open-minded and experience the user's world for a while (Kouprie & Visser 2009:446).

INTANGIBLE ASPECTS (DT). The quote below (Schön 1983:130) contextualises the supervisor's experience of the resident's case illustrating a different perspective to and understanding of modal shifts, as compared to designerly thinking's literature. It points to a current shortcoming in the discourse – modal shifts relating to people, feelings, perceptions and intangible aspects. The supervisor urges the resident to "step into the situation, to make himself part of it" (Schön 1983:131). What he is asking of the resident, is to make a modal shift, not only in activity mode, but to connect with the patient on an emotional level. In this way, the resident can build trust with the patient, and through empathy, establish a connection with the patient through his reflection on the therapy situation. Furthermore, Schön (1983:161) explains that "[t]he creation and maintenance of the virtual world on therapy is both a method of inquiry and a strategy of intervention". The affective and emotional sides to modal shifts provide a different vantage point from which to understand difficult situations, which will be missed if only a cognitive approach is taken.

PERSPECTIVES (DT). A human-centred approach informed by different perspectives therefore offers a designer a better background understanding of complex project matters. The adoption of a human-centred perspective enables the designer to connect with the user's tangible and intangible needs and requirements. The usefulness of empathy as a 'way of knowing' has been debated, but this study sets out to explore this conundrum hands-on in the studio through the biopic investigations. The profession shows that empathy can be integrated in spatial design. Brown (2009:49) describes the emphasis of empathy in design thinking and designerly thinking:

> It's possible to spend days, weeks, or months conducting research of this sort, but at the end of it all we will have little more than stacks of field notes, videotapes, and photographs unless we can connect with people we are observing at a fundamental level. We call this "empathy" and it is perhaps the most important distinction between academic thinking and design thinking. We are not trying to generate new knowledge, test a theory, or validate a scientific hypothesis – that's the work of our university colleagues and an indispensable part of our shared intellectual landscape. The mission of design thinking is to translate observations into insights into products and services that will improve lives (Brown 2009:49).

Brown (2009) states the value of empathy in a design thinking context and indicates its relation to designerly thinking by emphasising the difference, in a complementary way. This study, however, considers the two design discourses moving closer together with evidence from spatial design practices that employs empirical research intensive strategies to inform design decisions. These combine a human centred approach as used by Gensler (Coleman 2019), and a people-centric based practice, as the firm, Interior Architects (Midden 2019), advocates. Examples of other design firms combining design thinking and designerly thinking strategies in community projects and social change are Panorama Innovation (Costello 2019) and Fit Associates (du Plessis 2020). The essence of their operations includes collaboration, co-creation and participation.

TRANSFORMATIVE POTENTIAL. Literature furthermore reveals that modal shifts are not only present in different modes of activities or perspectives, but also in transformative potential. Mezirow (in Thompson & Thompson 2008:29) refers to reflective practice, where critical processes of reflection "can result in different understandings of a person's situation". Mezirow (1991:107-108) explains 'premise reflection' that challenges deep seated understandings and convictions of a designer's own ontological and epistemological views of the world that directly influences the transformative potential of a student designer. Within the context of transformative education, it includes cognitive, affective and value domains (Belenky et al 1986, Krathwohl et al 1964, Perry 1970). This is discussed further in *Chapter 4*: Transformative engagement.

2_Project / scenario framing

Framing (DℓT)

> When we set the problem, we select what we will treat as the "things" of the situation, we set the boundaries of our attention to it, and we impose upon it a coherence which allows us to say what is wrong and in which directions the situation needs to be changed. Problem setting is a process in which, interactively, we *name* the things to which we will attend and *frame* the context in which we will attend to them (Schön 1983:40).

FRAMING. Cross (2006:80) explains the development of a problem setting by referring to designers that "select features of the problem space" to *name,* and "areas of the solution space" to *frame,* the situation. Schön's (1983) theory of reflective practice furthermore relates the "notion of frame in design theory" within a cognitive definition of terms, which are informed by a "set of possible actions". This cognitive view of framing does not recognise "how value-laden frames can be" (Paton & Dorst 2011:575). They argue that there is wide research into the key characteristics of 'framing', but little into how it works, when framing is situated in practice where higher levels of experience is required.

> Within a design context, framing is often seen as the key creative step that allows an original solution to be produced. Designers report on the need to get to 'the problem behind the problem' (as initially presented by the client), and also about creating a 'fresh perspective' (Paton & Dorst 2011:573).

SITUATED PRACTICE (DℓT). Paton and Dorst (2011:575) claim that '*frames can change'* and that a practice-based, situated approach to framing is related to the way a situation is seen and represented, and how that is reframed to gather new frames for interpretation of the design context. Their study explores how framing is experienced as a "socially situated practice". This is illustrated with practitioners that frame and reframe expanded client briefs (Paton & Dorst 2011:576), where the designer takes on different roles to serve different purposes in the framing process: 'technician', facilitator', expert / artist' and 'collaborator'. Their results reveal barriers (fixation; problem-solving mental model of design; resistance to journey) and enablers (metaphor and analogy; contextual engagement; conjecture) to framing (Paton & Dorst 2011:585).

Krippendorff (2006:214-215) explains that reframing is a method of "understanding multiple paths to understanding an often-intractable situation." He lists various devices to derive alternatives, but stresses that,

> Reframing makes visible, solvable, or understandable what any one medium of representation hides. All devices suggested above amount to journeys that enlarge the conceptual spaces of designers. Jointly, they provide an understanding richer than either method alone. Their skilful use forces us to not get stuck or prematurely settle on one idea at the expense of better ones – a cognitive trap in which students often find themselves (Krippendorff 2006:217).

The literature shows that framing is an organic process that unfolds in and with a situation. The degree of understanding is directly related to the intensity of the engagement with this process. Students that take difficult situations at face value will not derive at the same complex insights.

Constructivist perspective (DℓT)

HOLISTIC APPROACH (DℓT). Framing is a critical part of understanding, as Schön's (1983) psychotherapy example combines cognitive and affective mental models for a holistic understanding of the complex issues. The focus can thus shift from solution concepts as an outcome, to the identification of possible problem features (Cross 2006:81). Schön (1983:128-130) describes framing a complex problem by referring to the patient's experiences. Instead of searching for cues of finding a standard solution, the student focuses to "discover the particular features of his problematic situation, and from their gradual discovery, designs as intervention" (Schön 1983:129). Framing a challenging and complex situation firstly requires subject knowledge, but also needs to determine "which problems are worth solving and what role the practitioner should play in their solution" (Schön 1983:129-130).

> The student has gotten stuck and does not know how to go further. The teacher, who attributes the student's predicament to his way of framing the problem, tries to make new sense of the problematic situation he is encountering at second hand. The situation is complex and uncertain, and there is a problem in finding the problem (Schön 1983:129).

The supervisor 'surfaces' issues in the reflective discussion with the resident and 'restructures', or 'reshapes' the situation by reframing it "through a web of moves, discovered consequences, implications, appreciations, and further moves" (Schön 1983:131) to reveal further problems, opportunities and issues to be understood. The supervisor urges the resident to "step into the situation" as a way of gaining a more connected understanding of the patient's condition (Schön 1983:131), which brings an experiential or emotional aspect to understanding the meaning of the framing. Gray (1996:576) defines the meaning of frames as a constructivist understanding:

> … by inference the reader comes to understand that frames are sense-making devices that establish the parameters of a problem. Depending on one's frame, situations are imbued with different meanings, and different data are required to prove that a problem exists. Thus, when disputants operate out of different frames, conflict is inevitable.

Explorative learning (DT)

PERSPECTIVES (DT). The degree of insight and empathic understanding of a situation depends on 'whose' perspectives are represented to reveal meaning embedded in frames. Norman (2013:218-222) posits that design thinking addresses "solving the correct problem" through a human-centred design process by contextualising the notion of framing. He refers to the British Design Council's *double-diamond design process model* as the "double diverge-converge pattern" (Norman 2013:222). This 'Double Diamond' (Design Council 2019) is focused on moving from challenge to outcome in a non-linear process of exploration. It firstly considers "finding the right problem" ('discover' and 'define') to frame and secondly, "finding the right solution" ('develop' and 'deliver') (Norman 2013:220). 'Discover' (framing) focuses on understanding instead of relying on assumptions (Design Council 2019). This iterative process relates to designerly thinking's dialogue with the situation and co-development of problem-solution (Cross 2006), although the Double Diamond is deliberately human-centred. In addition, IDEO views design thinking as a mind set, to remain open to possibilities and to embrace ambiguity as opportunities for intervention (IDEO – Design Thinking 2019). Furthermore, Brown (2009:15-16) refers to "three spaces for innovation" that enables the iterative or exploratory process – *inspiration*, *ideation* and *implementation*, illustrating it as a phased process to allow for with feedback from the user and exposing different worldviews.

3_Situation-led potential analysis

Solution-led goal analysis (DℓT)

CHALLENGING THE CONCEPT (DℓT): This study speculates about the revision of the concept solution-led goal analysis, by integrating aspects from DT and DℓT, due to an over emphasis on problems, goals and possible preconceived and superficial responses. Therefore, this research proposes a situation-led potential analysis to refocus design projects, by considering the inclusion of empathy and perspectives.

> That is to say, the designer-subjects jumped to ideas for solutions (or partial solutions) before they had fully formulated the problem. This is a reflection of the fact that designers are solution-led, not problem-led; for designers, it is the evaluation of the solution that is important not the analysis of the problem (Cross 2006:78).

Solution-led goal analysis resides within the context of problem formulation and design cognition. Cross (2006:78) argues that one of designers' cognitive strategies is to solve ill-defined problems with the emphasis on solution as articulated within the problem goals. The goals are flexible and subject to change according to the problem development and the evolution of solutions (Cross 2006:78).

PRECONCEIVED NOTIONS (DℓT). Schön's (1983:129-130) example of the psychotherapy dialogue between resident and supervisor, highlights the question of "what problems are worth solving". When the resident realises it becomes difficult to solve the initial problem, the notion of flexible goals are important where the resident attempts to "shape the situation to the frame" (Schön 1983:130, 141). The challenge remains to question the positivist epistemology that Schön (1983:165) criticises with this example, by

not being caught in pre-established objectives as a technical procedure. Rather, to follow the interactive dialogue with the situation. The supervisor prompts the resident with a question to provoke further consideration into the unspoken aspects related to the patient's situation, to keep the inquiry active and to prevent the resident from closing the patient's file prematurely by making narrow and limited conclusions (Schön 1983:136).

Solution focused design could lead to "early solution conjectures" (Cross 2006:79) and depending on the awareness and approach of the student, can either be used as a constructive generator of a series of solutions, or alternatively, result in proposals that are ill considered and superficial. Cross (2006:79) illustrates this by reporting on a study by Atman et al (1999) with engineering students that demonstrate that 'problem scoping' before the analysis phase results in "better designs". The findings furthermore reveal that if the problem is not well defined and the solution-led approach is the primary goal of the design process, the outcome of the design suffers. In contrast, some students find it difficult to move beyond the problem analysis phase into the design development. Atman et al (in Cross 2006:79) therefore bring attention to the concept of "problem scoping", which deals with "…'adequately setting up the problem before analysis begins'; including gathering a larger amount and wider range of problem-related information".

This investigation identifies preconceived notions as 'traps' in the design process, that endanger the well-intended solution-focused goal analysis, when considered in conjunction with preconceived ideas informed by the designer's own biases, prejudices, beliefs, perspectives and values. The potential within an educational design context is to confront the design students' personal worldview, in order to elicit a critical and reflective response. This could be possible by acknowledging different perspectives through expanding understanding though empathy.

Perspectives and empathy (DT)

PERSPECTIVES AND EMPATHY (DT). The Greater Good Studio's cafeteria project provides an example of the empathy continuum in a literal sense of what it means to adopt someone else's perspective. The designers see through the eyes of the children to obtain a deeper understanding of their lunchtime experience (Greater Good Studio – Academy for Global Citizenship 2020). The effect of the problematic situation negatively affects the children's health and wellbeing and influences negatively on the kitchen staff and lunchroom attendants, as the situation leaves them exposed to an unmanageable scenario. By better understanding the real-life condition, the design team is able to propose alternative strategies in an interactive process with stakeholders and users to facilitate a more streamlined and positive user experience. This is a very simplified explanation to illustrate a design relation. The process contains much more detail, input and effort, which are associated with respect and mutual values.

This example has a pragmatic foundation for intervention, which makes taking an empathetic view, a spontaneous one. The empathy challenge is expanded when an emotional encounter confronts a designer and the question arises whether empathy can be taught, or if it is a personal trait, instead. Cuff et al (2014) conclude with a definition of empathy after an extensive study into literature,

> Empathy is an emotional response (affective), dependent upon interaction between trait capacities and state influences. Empathic processes are automatically elicited but are also shaped by top-down control processes. The resulting emotion is similar to one's perception (directly experienced, or imagined) and understanding (cognitive empathy) of the stimulus emotion with recognition that the source of the emotion is not one's own (Cuff et al 2014:150).

EMPATHY AND UNDERSTANDING. Kouprie and Visser (2009) "relate the concept of empathy as developed in psychology" to a design context. They ask a pertinent question: "How does the design team make appropriate design choices for others who are unlike themselves?" (Kouprie & Visser 2009:437) and consider how designers can achieve it in projects. Kouprie and Visser are affiliated with industrial design engineering, noteworthy in the context of this study, as the first human-centred design considerations also emerged from product and engineering design (Archer 1965, McKim 1972). Empathy, as a "way of knowing" is a process that evolves over time and enables the designer to adopt the perspective of another person (Kouprie & Visser 2009:441-442). The concepts of time and perspective are important in the context of design, because when a designer assumes the role of the user, a shift in context and experience is expected that directly addresses different realities of living and possibly other worldviews. According to Mezirow (1997:5-6) 'frames of reference' consist of 'habits of mind (broad assumptions and ontological construction of the world) leading to 'points of view' (personal beliefs, feelings and judgements), which are in question when a different perspective is taken.

EMPATHY PITFALLS. The danger of using empathy in design is thus highlighted – the need for the designer to discard personal bias and prejudices. Thomas and McDonagh (2013:50) introduce the notion of "expanding the empathetic horizon", which relates directly to a designer's ability or capacity, or lack thereof, to shift perspectives according to a range of users in different contexts. This becomes relevant in light of the "indirect attribution" of empathy, where Heylighen and Dong (2019:114) consider the *Simulation Theorists'* (Goldman 2013; Stueber 2018) understanding of "ordinary mindreading abilities" that are based on a person self, as "egocentric and 'knowledge-poor'" (Stueber in Heylighen & Dong 2019:114).

Goldman (in Heylighen & Dong 2019:114) refers to two *levels* of mindreading, low-level mindreading as "perceptions, emotions" and high level mindreading as "beliefs, desires, hopes, and intentions". Goldman (in Heylighen & Dong 2019:114) further refers to two *routes* to mindreading, mirroring and reconstruction. 'Mirroring' as low level mindreading, related to discovery, sensations and emotions (Goldman 2013:202), which is prone to error due to personal, subjective bias and judgements. Bloom (2016:68) warns that empathy can be modified in such situations. This study equates this phenomenon to affective empathy that overshadows an experience, and a person loses perspective due to the strong reaction. In comparison, high-level mindreading's route to empathy is 'reconstruction', where a person attempts to "replicate or re-experience their (mental) state via a constructive process". The reconstructive route's possible flaws are associated with two concepts, 'omission' due to ignorance, and 'commission', because of egocentric bias (Goldman in Heylighen & Dong 2019:114-115).

Bloom (2016) warns against the pitfalls and limits of empathy and takes a rival position to other literature promoting its usefulness. He argues that empathy has a "narrow focus" like a spotlight and "spotlights only illuminate what they are pointed at, so empathy reflect our biases" (Bloom 2016:31). Furthermore,

> … whether or not we are consciously aware of it, empathy is modified by our beliefs, expectations, motivations, and judgements … Our empathetic experience is influenced by what we think about the person we are empathizing with and how we judge the situation that person is in (Bloom 2016:68).

TRANSFORMATION AND EMPATHY (DT). In this light, Kouprie and Visser (2009:439) pose the question whether "[t]raining and practical experience can enhance the designer's empathic understanding of its users". The question should not only reflect a yes or no response, but also indicate a degree of possibility to transform, as small incremental shifts could indicate change over time. As Mezirow (1997:5-6) points out, 'frames of reference' are difficult to modify due to our inner convictions and dispositions. In the spatial design disciplines, with emphasis on designer or architect as expert, this is especially relevant (Till 2009). In addition, architectural theory considers empathy as a highly intellectual and academic discourse,

> I would suggest that empathy extends our world spatially. Where imagination reaches into the future, empathy enables us to project ourselves into the inner worlds of the other on the basis of our bodily states. Our bodily states do not overlap with the bodily states of others, they are two distinct points of origin that are bridged by empathy. This inborn pre-reflective capacity to perceive the experience of others through the tissue of our own bodies – regardless of whether those others are persons, creatures, places or things – is a dynamic pattern of relationship that extends our awareness of the multi-layered emotional latency inhering in the situation. Empathy expands the domain of the personal to encompass the felt experience of the other, enlarging, enriching and informing the basis of our possible actions (Robinson 2015:48).

EMPATHY AND ARCHITECTURE (DT). This understanding of empathy, from *Architecture and Empathy* (Tidwell 2015), emphasise the importance of relating to another's situation and reality, as a way to influence our future actions. The book is a comprehensive documentation of the relation between imagination and architecture, sensory perception and material characteristics, and the effect of materials and matter on the human body, from a physical and neuroscience perspective. The academic and existential approach of the book provides an intellectual understanding of architecture and empathy. However, the social condition's relationship with architecture is not considered, which leaves a gap in the understanding of empathy on an interpersonal level.

> We architects have never been more urgently in need of the new approaches that a fresh way of thinking can provide. Fed up with the intellectual excesses of architectural theory in recent decades, we have been swept into the mandate for sustainability without a coherent philosophical framework. […] The tired dichotomies separating mind from body and the individual from social and natural worlds must be overcome with metaphors that are capable of continuing, bridging or weaving other opposing sides (Robinson 2015:54).

MINDSETS AND MEANING-MAKING (DℓT). Ball in Dorst (2019:122) argues for a radical shift from problem solving to a "new paradigm". He refers to meeting 21st century challenges and emphasises a focus on complexity theory and systems thinking, instead. Dorst (2019:122-123) explains this shift,

> … rather than goal-directed creation; change is achieved though influencing the system, rather than implementation of a plan to solve the problem; and a new state of relative stability can be achieved by creating resilience, rather than striving for an immutable structure – that so-called solution.

In this light, Krippendorff (2006:xv) argues that design needs to refocus its "well-trodden path" to conceptualise artefacts to "mean something to its users, that aid larger communities, and that support a society that is in the process of reconstructing itself in unprecedented ways and at record speeds." Solution-led goal analysis should therefore take cognisance of the direct relation between solution and user. Krippendorff (2006:2) outlines the importance of semantics or meaning-making as a "meaning-action circularity" in a study with Butter that defines product semantics as follows:

- *A systematic inquiry into how people attribute meanings to artifacts and interact with them accordingly*
- *A vocabulary and methodology for designing artifacts in view of the meanings they could acquire for their users and the communities of their stakeholders.* (Krippendorff 2006:2).

Krippendorff's (2006) focus on a 'semantic turn' therefore highlights intangible considerations in the context of solution-lead goal analysis. Lloyd (2019:171) introduces a 'social turn' that focuses not only on human agency, but reaches further to include the methods, representations and tools that designers use in the process; another social action.

> The focus on both methodology and social practice has enriched the study of designing by letting the idea of discourse explicitly percolate through the discipline, allowing different perspectives and ways of thinking to coexist (Lloyd 2019:173).

This shift, from problem to areas of intervention and perspective, therefore brings another understanding of the role of goals in the pursuit of solutions where purpose and people are involved. Various views and various ways of engagement relate to different ways of inquiry.

4_Dialogue with the situation

Dialogue with the situation (DℓT)

> Thus the practitioner evaluates his experiment in reframing the problematic situation not only by his ability to solve the new problem he has set but by his appreciations of the unintended effects of action, and especially by his ability, in conversation with the situation, to make an artefact that is coherent and an idea that is understandable. But the achievement of coherence does not put an end to inquiry (Schön 1983:136).

IN DIALOGUE WITH (DℓT). Dewey (1910/1997) first introduced 'dialogue with the situation' in the seminal book, *How we think*. Schön (1983) expands this thinking as part of 'reflection-in-action'. As a practical

educator and pragmatist philosopher, Dewey directly relates *thinking* and *doing* as a rigorous, active process, creating and testing hypotheses within real world environments (Rolfe 2014:1179). The relation between the inquirer and the situation is *transactional* and the inquirer (designer) moulds the situation, but this transaction is relational and the designer's own "models and appreciations" are shaped by the situation in return (Schön 1983:150-151). As interactive and transactional process, the dialogue with the situation reveals new meanings and Krippendorff's (2006:23-24) proposition of intertextual and textual design matters informs designerly thinking as creation of meaning, instead of artefacts. The dialogue therefore includes both tangible and intangible aspects as an interactive inquiry.

ACTION VERBS (DT). The interaction is enabled through different modalities of engagement between designer, user, context and situation. Considering different action verbs or triads as part of the process ensure different ways of understanding: 'think-make-share' (Reynders 2012:4), 'think-feel-do' (Fisher & Clark 2012) and 'say-make-do' (Sanders in Tharp & Tharp 2018:75).

Explorative learning (DT)

COLLABORATIVE ENGAGEMENT (DT). The Greater Good Studio's collaborative co-design project aims "to reimagine the school food experience" (Greater Good Studio – The Academy of Global Citizenship 2020). They explore the problem space by observing the children's responses, and observe and participate in the preparation of lunches with staff and serve food with lunchroom attendants. This allows for an empathetic understanding of the larger issue, the 'lunch line' or framing of the design challenge. This collaborative process guides designers to develop a scenario synthesis providing cues into the opportunities, testing possible solutions within the studio, which are then tested in real time in the cafeteria with the children. The outcome of this explorative process reveals two noteworthy things: mind sets and behaviours. When new food options are presented, children remain engaged and curious, with less food wastage and better consumption of meals. The exploratory process enables active dialogue between designers, staff and children, through iteration, testing, prototyping and feedback (repetitive observation in studio and cafeteria) (The Greater Good Studio – The Academy for Global Citizenship 2020). The Design Council (2019) contextualises the design thinking exploratory process by emphasising placing people first, considering visual and inclusive communication, being collaborative and co-creative, and focusing on iteration to streamline the exploration process.

WORLDVIEWS (DL). The exploratory process extends as example of the interactive psychotherapy dialogue between resident and supervisor (regarding a patient), revealing "unintended changes which give the situations new meanings" (Schön 1983:131). The dialogue between student and teacher is both reflective and reflexive. Reflectivity, as the interrelation with the patient, reveals the problem and the unknowable aspects the resident deals with. The resident furthermore reflects on the impact of his involvement in the process and aspects he brings to the patient's healing process that are filtered by his own worldviews, beliefs, opinions and prejudices that confront him directly. Mezirow (1997:5-6) relates this understanding to 'frames of reference' and 'habits of mind', influencing ontological views and epistemological positions within complex situations, respectively. Moreover, these manifestations in the resident affects the way meaning is made and it is critical to shed own preconceived ideas, which

could be tainted and cause interference with a transparent reflective process. Furthermore, the dialogue includes interaction with abstractions, for example, with the problem, with possible interventions, with 'explicit knowledge' and 'tacit knowing'. "Through the unintended effects of action, the situation talks back" and this deep engagement in the dialogue allows new questions to arise, which enables the resident to move forward in working with the patient (Schön 1983:135, 137).

> In a practitioner's reflective conversation with a situation that he treats as unique and uncertain he functions as an agent / experiment ... Through his transaction with the situation, he shapes it and makes himself part of it (Schön 1983: 163).

Organization (DT)

ORGANIZATION (DT). The two examples above demonstrate the value of interaction between different stakeholders. However, Laursen and Haase (2019:820, 825) include organization as a suggested action of design thinking, but the practice view indicates it to be integral to the process, instead. As demonstrated above, collaboration can be considered as part of designerly thinking methodology, although not included in theoretical literature. As such, this study speculates that organisation be considered as part of an integrated methodology, because it is not only logistical and operational as academic literature suggest. The practice view provides evidence that a human-centred design approach is not only an operational tool, but also an intrinsic part of the approach, perspective and also overall method when dealing with complex design issues (Norman 2013; Brown 2009).

HUMAN AGENCY. In addition, Awan et al (2011:31) explain an agent's resolve, including a transformative intent within a dynamic spatial context, to be "responsive and flexible" to the unpredictable patterns. This becomes related to human agency and the intangible conditions and meanings embedded in human interrelations and connections. Agency, inscribed in this process, is emphasised by Till (2009:167) who advocates for equal representation of voices as a transformative agency and a shared enterprise. Dialogue with the situation is therefore not an isolated event, but an interactive condition that moves between different modes of thinking and ways of operating. Therefore, time becomes part of the situation, as the dialogue requires moments of reflection and considering representations in different media, to demonstrate the temporal nature of occupying spaces and the contingency associated with a fluid condition (Till 2009:113).

> However, time in all its complexity cannot be summoned up in a single system of representation, so one has to resort to multiple modes of communication: drawn, made, photographed, told, enumerated, enacted. The tendency is to concentrate on one mode of representation, and so on one temporal condition (Till 2009:113).

Dialogue with the situation, therefore becomes much broader when details of the situation are considered – dialogue with the process, people, ideas, possibilities, challenges, understandings and values. The context or situation of a design project therefore assists in reflection-in-action, as it provides information to (re)frame problems (Visser 2011:24) in an active dialogue that includes the detailed situation as speculated above. Schön's (1983:40) distinction between problem solving and problem setting, where a constructivist perspective and approach becomes instrumental to delving into deeper meanings that are hidden and difficult to articulate, then becomes significant as,

> … the process by which we define the decision to be made, the ends to be achieved, and the means that may be chosen. In real-world practice, problems do not present themselves to the practitioner as givens. They must be constructed from the materials of problematic situations which are puzzling, troubling and uncertain" (Schön 1983:40).

The link to ill-defined problems can therefore be made to the 'dialogue with the situation', as resident, supervisor, student or designer are actively scrutinising all aspects of the situation in an attempt to find both understanding and meaning of all perspectives. In this way, a connected engagement includes a range of modes, including cognitive, affective and reflective. Cross (2006:12) therefore identifies it as one of the five aspects of designerly ways of knowing. The psychiatric example, however, demonstrates it to be a part of the practice of a variety of professional fields, and is not only reserved for design disciplines.

5_Scenario exploration

Co-development of problem and solution (DℓT)

CO-DEVELOPMENT OF PROBLEM-SOLUTION (DℓT). Cross (2006) describes the co-evolution of problem and solution as a meandering exploration, instead of a linear process. Schön (1983:165) supports this view by saying that "means and ends are framed interdependently. And their inquiry is a transaction with the situation in which knowing and doing are inseparable". The process of inquiry is therefore not focused on a preconceived outcome, but relies on the interrelation between the various phases to inform the route to action. Dorst (2019:122) considers design to be a learning process, "*name – frame – move – evaluate*", an exploratory process, comparable to design thinking's phase models, as the Double Diamond and the IDEO human-centred design process (Design Council 2019, IDEO Design Kit 2019). This perspective aligns with the study's focus on a constructivist inquiry, where meaning-making is based on a spontaneous investigatory experience. "It seems that creative design is not a matter of first fixing the problem and then searching for a satisfactory solution concept" (Dorst & Cross 2001:434).

> The designer's attention oscillates between the two, forming partial structurings of the two 'spaces' of problem and solution. Designing appears to be an 'appositional' search for a matching problem-solution pair, rather than a propositional argument from problem to solution (Cross 2006:91).

ITERATIVE DESIGN PROCESS. In contrast, Maher and Poon's (1996) Problem-Design Exploration Model is a formal model representing the iterative design process, alternating between the problem- and solution space dimensions. Over time, the iteration and evolution of the problem-solution space allows for the generation of alternatives. Diagonal movement between problem and solution spaces are informed by focus and fitness of the solution derived from the problem, and vice versa, refocusing the problem by scrutinising the solution (Maher & Poon 1996:195-199). Although this is a formal model, it allows for 'random' exploration within the problem setting.

Schön's psychotherapy example demonstrates this 'back and forth' motion between problem and solution, firstly as an unconscious process, when the resident is confronted with issues that he is unable to articulate when first interacting with the patient. But with iteration comes "[s]eeing *this* situation as *that* one, one may also *do* in this situation *as* in that one" (Schön 1983:139). What Schön is referring to here, relates to Buchanan's (1992:9-11) concept of 'placements', as placeholders in situations where too many variables are present to make sense of its complexity. Johansson-Sköldberg et al (2013:125) explain Buchanan's 'placements' to be,

> 'tools' for intuitively or deliberately shaping a design situation, identifying the views of all participants, the issues of concern, and the intervention that becomes a working hypothesis for exploration and development, thereby letting the problem formulation and solution go hand in hand rather than as sequential steps.

Dorst and Cross (2001:434) concur by describing creative design as a process of "developing and refining together both the formulation of a problem and ideas for a solution, with constant iteration of analysis, synthesis and evaluation processes between the two…" The RIBA practice and management handbook also illustrates an iterative design process with four phases, with feedback loops in-between (Lawson 1990:24). This is not meant as a sequential map, as there could be "unpredictable jumps" between the phases. Dorst and Cross (2001:435) describe the "creative event" as an exploratory space, which is unstable and evolving, in which bridges between the problem-solution appears, as designers identify related information to assist in "partial structuring of the problem-solution". They do however, caution against expectations to answers that can lead to *default* projects (Dorst & Cross 2001:435). In order to address preconceived responses, Dorst (2006:17) makes a valuable proposition by suggesting the "design problem" to be temporarily bracketed, which "allows new frames of reference and descriptions of the design activity to emerge". The space for exploration is expanded in this way, which enables the designer to engage freely with the issues of concern in a project context that does not predict or prescribe proposed outcomes.

Phase models (DT)

PHASED INQUIRY. Exploratory investigation related to design thinking methodology, is described as phase models, or process models (Laursen & Haase 2019: 821). Phase models contain sequential steps of varying descriptions, but all lead to the same goal – addressing the needs and requirements of the user or customer (Brown 2009; Camacho 2016; Tschimmel 2012). Various interpretations illustrate design thinking's integrative actions, in order to deepen understanding and clarify insights in a particular setting and scenario (Table 3-2). IDEO.org, a non-profit design thinking organisation reveals that human-centred design is about mind sets and outlines learning from failure, making it, creative confidence, empathy, embracing ambiguity, optimism and iteration, as key aspects of the philosophy of their design kit (ideo.org n.d.).

Table 3-2: Summary of design thinking phase models

Phase model	Problem space	[Development space]	Solution space
UK Design Council (2019)	discover > define (what, why)	develop	deliver (how)
IDEO 3 I model **IDEO 5 HCD model (toolkit)** (IDEO 2019)	inspiration discovery > ideation	ideation interpretation	implementation experimentation > evolution
d.school Stanford (2020)	empathize > define	ideate	prototype > test
Darden Business School (2021)	What is? Explore current reality	What if? Envision new future	What wows? Make choices What works? Phases in market
The Greater Good Studio (2019)	framing > research	synthesis > concepting	prototyping > piloting
Interaction Design Foundation (n.d.) (consolidated model)	inspiration understand > observe > point of view	ideation ideate > prototype > test	implementation storytelling > pilot > business model
Evolution 6² model (Tshimmel et al 2015)	emergence > empathy	experimentation > elaboration	exposition > extension

> Human-centred design is a problem-solving process grounded in empathy and iteration. It's also a powerful framework for creating alignment among people from diverse backgrounds and turning ideas into action (Greater Good Studio 2019).

The phases relate to other descriptions of phase model's problem space, development space and solution space. Through phase models, the start to investigating design problems are grounded in and directly informed by the context, the tangible and intangible needs and requirements of people. The cafeteria food example of the Greater Good Studio (2019) uses a six-step human-centred design process to engage with difficult projects in a hands-on way:

Framing: the design team aims to "create engagements" not artefacts, through appreciative inquiry and by incorporating the end users at the start (Greater Good Studio – The Academy of Global Citizenship 2020).

Research: the approach to "observing behaviour in context" instead of using surveys or focus groups, allow the team to develop empathy and to immerse themselves in the user's reality. The detailed qualitative data collection provides in-depth understanding through in-context observation of children and staff. This includes the use of Go-Pro cameras on selected children's heads to provide an immersive perspective and ceiling mounted camera footage provides time lapse video to determine traffic flow (Greater Good Studio – The Academy of Global Citizenship 2020).

Synthesis: "Traditional design focuses on finding and meeting unmet needs, but we also focus on assets – the existing tools, habits and relationships" (https://greatergoodstudio.com/case-studies/academy-for-global-citizenship/ 2019). Qualitative data assist to identify the main challenge, the 'lunch line', through emerging themes (as inductive study) to better understand behaviour patterns. "How might we" statements are formulated to address the stressed food decision making process, seeing over the counter and through the reflective screen (Greater Good Studio – The Academy of Global Citizenship 2020).

Concepting: “thought-provoking” tools are used to build creative confidence when engaging diverse stakeholders (storyboards and brainstorming) to defer judgement. Parents are included to brainstorm how to increase time for making food choices and reveal the concept of serving food in ‘courses’ (Greater Good Studio – The Academy of Global Citizenship 2020).

Prototyping: “fast cheap ways to make your ideas tangible, we get closer to knowing what will work, what won’t and why”, in addition, “we create props that simulate the full experience” (Greater Good Studio – The Academy of Global Citizenship 2020). The idea is tested in studio, by presenting prototypes as ‘courses’ to a student group to collect evidence for feasibility and flow as idea feedback through an iteration loop. The team visualises the full service and creates a ‘map’ to test in the cafeteria – no opinions are expressed (Greater Good Studio – The Academy of Global Citizenship 2020).

Piloting: “we test solutions in real time”, through small scale testing. During the process, reflecting on the data recorded provides direct feedback, limits biased behaviours and lowers cost. The process unfolded with two rounds of testing multiple food choices through food presentation with long trays and small bowls in the cafeteria context. Testing the new service style over five days and 50 children results in interested and happy children, due to food choices as a new mind set, resulting in less food wastage and healthier habits as a new behaviour (Greater Good Studio – The Academy of Global Citizenship 2020).

“This project helped us literally see the world from a child’s point of view” – Sarah Elizabeth Ippel (Greater Good Studio – The Academy of Global Citizenship 2020). The value of the phase model lies in the deepening of understanding and insight, through engagement, participation and an embodied experience in the project context. In this way, the design development stage of the project is based on actual evidence, and not based on assumptions or preconceived notions by designers.

6_Critical reflection

Explorative learning (DT)

EXPLORATIVE LEARNING (DT). Contextualises the actions of reflective practice, as each step in the process offers opportunities for feedback through reflection on complex matters. Norman (2013:222) describes the iterative cycle of a human-centred approach (spiral method) consisting of four activities, observation, idea generation (ideation), prototyping and testing. He mentions that iteration is required to ensure “continual refinement and enhancement” or “rapid prototyping and testing” (Norman 2013:229). He places this in context of human cognition and emotion by referring to the interrelated nature of the visceral, behavioural and reflective levels of processing, and argues that “design must take place at all levels” (Norman 2013:49-50. 53). This designerly thinking understanding contextualises the academic relation to reflective practice in design thinking.

> The extent of our capacity for reciprocal reflection-in-action can be discovered only through an action science which seeks to make what some of us do on rare occasions into a dominant pattern of practice (Schön 1983:354).

REFLECTIVE PRACTICE (DℓT). Schön (1983) considers 'reflection-in-action' and 'reflection-on-action' as part of the exploratory process or iterative design, integral to designerly thinking, as other authors support it as part of a methodology for design inquiry (Cross 2006). Schön (1983:280) believes 'thinking' and 'doing' are integral modes to reflective practice, as "[d]oing extends thinking" and becomes a complementary reflection-in-action. "It is true, certainly, that an inquirer's continuing conversation with his situation may lead, open-endedly, to renewal of reflection" (Schön 1983:280). Thompson and Thompson (2008:16) explain reflection-in-action as thinking during an activity, and reflection-on-action as reviewing a past event or design task, to gain understanding of our experience. They identify a third type of reflection, that Schön (1983) does not present, 'reflection-for-action', in anticipation of what might happen in the future (Thompson & Thompson 2008:16). The value of Schön's (1983) contribution is to consider the limits of technical rationality:

> Technical Rationality depends on agreement about ends. When ends are fixed and clear then the decision to act can present itself as an instrumental problem. But when ends are confused and conflicting, there is as yet no 'problem' to solve. A conflict of ends cannot be resolved by the use of techniques derived from applied research. It is rather through the non-technical process of framing the problematic situation that we may organize and clarify both ends to be achieved and the possible means of achieving them (Schön 1983:41).

Schön's reflection-in-action concerning complex problems reveals the need for a 'critical' reflective practice. One that includes both depth and breadth of criticality, with the former addressing unbiased "underlying arguments and assumptions" and the latter considering "the wider social and political context of our practice" (Thompson & Thompson 2008:155). "He [Schön] aptly captured the crisis of confidence that had evolved due to a lack of stable scientific knowledge bases and the failure of instrumental problem solving to deal with the society's heightened complexities" (Craig 2010:191). The question of 'reflective' (thoughtful and analytical action) or 'reflexive' (self-awareness of designers' personal impact in a situation), is discussed by Thompson and Thompson (2008:20), who conclude that reflective practice should include both.

Schön's (1983:129, 132) psychiatry example relates to the reflective discussion between the resident and the supervisor. This interaction assists the resident to frame the issue regarding the patient's condition through a "gradual discovery" of the difficult situation. Furthermore, "new discoveries" are made during the process of "reflection-in-action".

> The process spirals through stages of appreciation, action, and reappreciation. The unique and uncertain situation comes to be understood through the attempt to change it, and changed through the attempt to understand it (Schön 1983:132).

Reflective practice can therefore be seen as a transactional process. Tovey (2015:61) relates reflective practice to a dialogue (instead of a directional action), where the designer negotiates between the

desired and reality in a three-step process (framing, moving, and evaluating). Reflective practice can therefore be seen in relation to design thinking's phase models (Design Council 2019; IDEO 2019), where various stages guide the process. In this way, three dimensions of reflection (cognitive, affective and value) are included, compared to practice where the cognitive often takes precedence over the emotional and value dimensions, to the detriment of the designer and the project at hand (Thompson & Thompson 2008:32). This study supports this notion within a design educational milieu. The emotional side, not only regarding reflection, but also considering way of knowing, is neglected and therefore becomes the focus of this study.

WORLDVIEWS. Argyris & Schön's (1974, 1996) single and double loop learning provide the environment for reflective practice, when actions (single) and assumptions (double) are considered, respectively. Triple loop learning is often related to them although they never used the term 'triple loop' (Tosey et al 2012:292) but rather informed by Learning III (after Bateson 1972) that acknowledges a larger situational context. Considerations of loop learning and 'reflective judgement' (King & Kitchener 1994) are discussed in *Chapter 4*. Reflective practice therefore provides opportunities for deepening understanding of complex projects, and in that way, gives scope for better framing of difficult situations. In addition, the designer is confronted with transformative thinking that challenges personal worldviews to include and understanding of other people's perspectives and experiences.

Tools and methods

Design thinking (DT) tools and methods

Literature reveals the availability of a wide variety of tools and techniques, often referred to as the design thinking toolbox (Curedale 2013). Criticism directly relates to its exploratory nature and the seemingly random allocation of tools and techniques to 'match' the right option for a task during the various design stages. Laursen and Haase (2019) argue that it could be challenging for 'non-designers' to make an informed selection. To address the critique, Tschimmel (2012) presents a classification of design thinking tools according to design actions for application in different project contexts and situations:

Table 3-3: Design thinking actions and related tools (adapted from Tschimmel 2012:12-17)

"Tools for observation, getting empathy and clarifying the project task"	"Tools for idea generation and experimentation"
– Observation and register on place – Mind maps and other kind of information maps – Personas and empathy map	– Brainwriting and brainsketching – Sketching – Visual and semantic confrontations
"Tools for elaboration and development"	**"Tools for communicating and delivering"**
– Storyboard – Rapid prototyping	– Storytelling – Learning experiences / test

Moreover, Camacho (2018:631-637) relates tools and techniques to the process principles of an integrative design thinking model that speak to actions within fundamental principles. Similarly, Hassi & Laakso (2011:59) give an outline of tools and techniques in a three-dimensional framework, each relating ways of knowing as part of a design thinking methodology. The Stanford d.School's Design Thinking Process Guide (2016) (d.school process Guide n.d.) links the five step process to specific tools and techniques and likewise, the IDEO HCD Toolkit (2009) and the IDEO Field Guide to Human Centred Design (2015) (IDEO Design Kit 2019). The UK Design Council has a methods bank, to 'match' various methods to various tasks in three different areas of investigation: explore, shape and build (Design Council 2019). The Evolution 6² Model (Tschimmel et al 2015) includes tools and methods in a six phased model to address pertinent aspects.

A wide variety of methods and techniques are recorded in a study by Fleury, Stabile and Carvvalho (in Laursen & Haase 2019:825-826). Tools and methods are based in ethnography, making the approach human-centred in nature – delving deeper and connecting stronger (Costello 2019). Practices are increasingly connecting specific tools to related process stages (Coleman 2019, Fern Tiger Associates 2013).

Designerly thinking (DℓT) tools and methods

The research study conducted by Laursen and Haase (2019:820) provides an overview of the tools and methods used in designerly thinking. They list three overall categories:

> **Tools for inquiry:** Interviews, focus groups, observations, ethnography
> **Tools for identifying a direction**: Narratives of ideal futures, future scenarios, character space, analogy/metaphor
> **Tools for creating a solution**: Combination, mutation, first principles, emergence

A further inquiry reveals that Cross (2006) and Krippendorff (2006) include examples or suggestions. Noteworthy is the overlap in some of those mentioned to design thinking's tools and methods as detailed in the section on design thinking. In addition, some of the tools and methods for designerly thinking are abstract concepts that pose a potential challenge for application if a designer has no prior knowledge. Cross (2006) outlines various strategies or methods to understand design cognition, which Laursen and Haase (2019) consider for the identification of tools and methods, surely in conjunction with other sources. Their selection from Cross (2006) shows an over emphasis on 'problem formulation' as considerations for concepts incorporated in the designerly thinking methodological approach. They consider nothing from 'solution generation' and only include modal shifts from 'process strategy' (Laursen & Haase 2019:820). Krippendorff (2006:207-208) includes a chapter on design methods that, for the first time in the designerly thinking literature, explicitly refer to human-centred design and explains human-centredness in a larger context to demonstrate the complex world that requires responsive design initiatives as a "semantic turn".

> It amounts to redrawing the boundaries of design, radically embracing human-centredness and fuelling inquiries into various meanings, design methods, and a rhetoric that enables designers to collaborate with other professions on a more even footing. Much needs to be done, it is part of the discursive nature of design that the project of design can never be complete because it is embedded in culture's shifting conversations and technological developments (Krippendorff 2006:208).

Summary

Empathy and human-centred design

The discussion in this chapter reveals a strong synergy between design thinking and designerly thinking, especially concerning the touchpoints of empathy and a human-centred approach. These are emerging in the spatial design disciplines, but this study speculates that a stronger synthesis is possible. The inclusion of the affective and emotional domain can offer a counterpoint to the heavy cognitive and objective approach, especially in architecture, in the way designers view and understand projects. When users' perspectives are obtained through an empathetic process, real life scenarios are highlighted that are not always visible through a conventional design inquiry. One of the largest benefits of an empathetic approach is the confrontation of personal worldviews of designers as the stimulus for connected and transformative learning. When pre-conceived ideas, individual biases and predictable responses are challenged, ontological shifts and epistemological transitions could become possible.

Table 3-4: Methodological relation summary – designerly thinking and design thinking

Designerly thinking	Design thinking
Reflective practice: role of the designer – not only to reflect on the process – but also acknowledging a personal influence on the process due to individual worldview. Inclusion of emotional and affective domain – determine futures that work well and feel good – incorporate views of users.	**Exploratory learning**: non-linear and iterative process – enables change in mind set and behaviour in all stakeholders, users and designers included Reflection-in-action and reflection-on-action – integral to development of ideas – collaborative dialogue
Framing: emphasis on situational, specific and particular scenarios – rich in meaning – look beyond problems as a social practice Reference to problem is questioned – proposes reference to project setting / scenario / situation – instead of problem framing.	**Phased models**: various actions in different phases focus attention on specific areas of investigation – brings greater clarity and comprehension of complex and undefinable situations Three main areas of consideration allow the design team to mobilise the exploration – framing and understanding of social engagements – different points of view as a process of discovery – formulation and articulation of concepts or themes to envision possible scenarios Application of provoking and engaging tools and techniques – guides a collaborative development – testing, simulating and prototyping of ideas in real time and in context – direct feedback from users Phase models considers simultaneously
Co-development of problem and solution: active exploratory process – project description is kept open ended – allow for unintended consequences to appear	
Dialogue with the situation: a stimulus by incorporating a variety of modes of engagement – conversation – transaction – between designer and aspects – bracketed insertions [allows for flexibility] For example, dialogue with	

– [process, people, ideas, possibilities, challenges, understandings, fears, celebrations, values, meanings]	– problem space – solution space
Modal shifts: manifest in a variety of ways in the design process – shifting between different activities or operational modes of design engagement Modal shifts also provide opportunities – refocusing perspectives – including multiple users' explicit and implicit needs and requirements. Shifts in ontological views and epistemological approaches are challenged – deep engagement offers scope for deep transformations in designers as individuals	**Perspectives and empathy**: (regardless of empathy criticism) adoption of different perspectives through immersion in another's word – unfamiliar context – designer suspends personal bias and prejudices Empathy, as a way of thinking, or knowing – brings designer closer to realities of projects – confronts with challenging details to internalise, [otherwise go unnoticed] Question of time and understanding – capacity of a designer to adopt a different view – possibility of 'expanding the empathetic horizon' – shifting between roles / personas, designer / user
Solution-led goal analysis: presents a challenge in terms of the designer's application and approach to identifying goals and formulating solutions – hindrance and obstacle, when preconceived ideas and biases guide the process Focus on agency, contingency, resilience and a systems approach – worldviews and pre-established objectives are confronted	**Organization**: multi-disciplinary interactions concerning difficult design issues – possibilities for co-creation and collaboration Organization becomes human-centred – operational based – people, systems, and creation are incorporated – promote incremental change within situated contexts
Tools and methods: related to academic or scientific focused activities – however, human-centred methods are incorporated from the perspective of meaning-making – prevalence of 'connected' methods in educational design environments are emerging within spatial design studios	**Tools and methods**: hands-on activities to obtain first-hand data about people in places. – activities are 'user-friendly' and coincide with different stages of the inquiry – focused to extract deeper meanings, behavioural matters, intangible aspects and value driven concepts.
Mini-summary – Designerly thinking (DℓT) – Methodology reveals a great need towards an increasingly constructive design approach – Strong academic / theoretical base, supported by various research studies. – The inclusion of the psychotherapy dialogue, offers insight to an expanded designerly thinking that includes the emotional, affective, feelings and intangible aspects to complement the strong cognitive and pragmatic approach. – The historical background from the sciences and engineering can be refocused with a wider lens that also includes social conditions, meaning-making and human agency.	**Mini-summary – Design thinking (DT)** – The discussion emphasises the relation between people and the design project as an interactive dialogue that considers physical requirements, – It also reveals behavioural and emotional needs. – The evidence of integration tools and methods in a rigorous design practice, demonstrates an expanded design thinking methodology – It focuses on the essence of what it means to understand better and to formulate insight into perspectives other than that of the designer.

Design thinking – designerly thinking intersection

The shared paradigm of designerly thinking and design thinking, wicked problems, abductive reasoning and contextual meaning, give a platform from which to relate the two design discourses' methodologies. The discussion in this chapter reveals that there are many points of intersection that could potentially be spaces for designerly thinking and design thinking to move closer together. The individual foundations and origins mean that both bring different aspects of scope of design inquiry, which together, could be considered a richer and expanded design discourse. Evidence from design education and academia indicates the search for more connected methods, and practice shows integration, where research methods are being included in human-centred approaches. Therefore, this study considers the touchpoints as places of action, stimulus and transformation, grounded by perspectives and modal shifts (Figure 3-1).

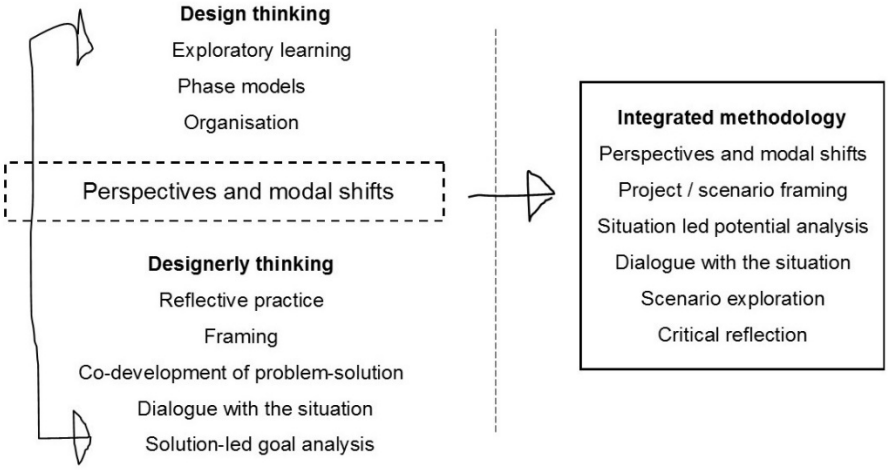

Figure 3-1: Shared methodological areas (DT and DℓT)

Chapter summary

Chapter 3 – Human-centred Design shows the potential of designerly thinking and design thinking to move closer together at various points of intersection. The value of this view is the potential impact on student designers, being exposed to a different ways of engagement and knowing within the context of different studio projects as part of their design learning. If the intent is to develop designers that are well-rounded and can work autonomously, then surely their design exposure should include multiple tools and methods in order to prepare them to address complex problems in practice. Different contexts and scenarios require a preparedness that is resilient, adaptable, responsive and responsible. Perhaps this integrated approach (theory and practice) could enable design students that are critically reflective and connected to projects, users and contexts, to show care that reaches beyond the profession of architecture into the everyday life of communities.