Design for Human Connectivity
- An Exploration Through Contemporary Work Situations

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May, 2022

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Abstract

This thesis presents a body of work that begins the formalisation and growth of Design for Human Connectivity (DfHC) as a distinct field of design research and practice. The research is contextualised within contemporary work situations – characterised by unfamiliarity of people and context – where the importance of a person's connections to others is matched by the challenges faced in establishing those connections.

A central proposition of this work is that a shift in research is required, away from the current predominant focus on HC outcomes (i.e., the value people derive from their connections in the form of opportunities and benefits), to better supporting people in successfully navigating the HC process. Design research and practice can play a critical role in bringing about this shift. Doing so, however, requires creating a consistent structure for DfHC to aid the scoping of HC challenges and the evaluation of HC outputs, and to support more creative and collaborative HC research, design, and practice. It requires supporting designers and practitioners with the requisite tools to guide both generative and evaluative DfHC activities.

Addressing these needs is achieved by first developing a new HC process framework – the Connector's Journey – comprising five distinct phases that specify a person's objectives and requirements throughout the process. The introduction and interrogation of the generally overlooked first phase – Finding – grounds the journey, introduces unique tactics that may be adopted for achieving this phase, and highlights the critical links between phases. Thereafter a series of studies help deepen our understanding of the individual, social, and contextual factors that can influence the HC process. Together, this work grounds and aids the development and application of a new tool – a set of 19 design prompts – that support DfHC. Successful application and evaluation of the tool in three real-world cases confirms its usefulness and usability and provides confidence regarding its generalisability. The foundation is laid for an exciting programme of DfHC research and practice to follow.

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Although it is my name on the front of this document, this thesis was a team effort. I am grateful to the many people who have supported me throughout this project.

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1. Introduction

"We often speak about the world getting smaller. Physically, of course, it is not. The connections between people and locations, though, have gotten both closer and more distant than even our recent ancestors might ever have guessed... We still operate socially, though, through patterns which look much like our primate cousins... We have literally changed the face of the Earth, but we have never left behind our ancient roots".

(Metcalf, 2014, p. 2)

Human Connectivity: an under-explored opportunity for design research and practice

Design activities address a multitude of challenges, big and small, transforming *how things are* into *how things ought to be* (Simon, 1996). A complex and growing global challenge impacting millions of people in their personal and professional lives is that of Human connectivity (HC) – referring here to *the process and outcomes of connecting to others*. Despite HC outcomes satisfying numerous fundamental human needs – from providing a sense of belonging to granting access to key resources – people in all walks of life are failing to successfully navigate the HC process as required to satisfy those needs.

Design can play an important role in supporting people through the HC process. Doing so, however, requires supporting designers and practitioners[1] themselves with tools and methods tailored to the unique challenges and opportunities of HC. Given the urgency, complexity, and scale of the HC challenges that impact the everyday lives of millions of people, ranging from the so-called epidemic of loneliness in society and in the workplace (Murthy, 2017) to maintaining

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[1] As will be introduced further in this chapter, the focus of this thesis is HC in certain organisational contexts. When using the terms "designers and practitioners" throughout the thesis, we are referring to professional designers as well as anyone who *designs*, or "who devises courses of action aimed at changing existing situations into preferred ones" (Simon, 1996, p. 111). In organisational contexts, this includes managers, event organisers, human resource specialists, organisational design consultants, team leaders, and more. Scaling the impact of this work will be achieved by supporting all such people who "design" products, services, systems, events, and other interventions that either directly or indirectly seek to deliver positive human connectivity outcomes.

valuable connections in increasingly fluid and distributed work models (Kropp, 2021), developing a distinct field of research and practice around HC represents a vast and exciting opportunity for design.

This thesis begins the formalisation of *Design for Human Connectivity* (DfHC) as a distinct field of design research and practice. Specifically, this thesis presents a DfHC framework and addresses initial gaps through a series of studies which together provide a strong foundation for future research. While much of the learning within the thesis may be generalisable across a range of personal and professional contexts, the primary focus is on professional connections within specific organisational situations.

This introduction chapter establishes HC as a fundamental human need, frames this work in terms of particularly challenging organisational situations, and highlights the current state of HC in design. The aims, objectives, philosophical stance, methodology, and methods of the research are presented along with the structure for the rest of the thesis.

Although this thesis only scratches the surface of the work needed, it aims to lay the foundation for DfHC and highlight the potential for this exciting new field of design research and practice. This will undoubtedly be just one of many bodies of work that addresses the growing and increasingly complex HC challenges people and organisations will face in the coming decades.

Human connectivity (HC): a fundamental human need

Humans are a fundamentally social species. Connections to others play an essential role in many aspects of a person's life. Through a person's connections to others, substantial value is derived in the form of opportunities and benefits ranging from personal and intangible (e.g., the sense of belonging one derives from being accepted into a community) (Baumeister & Leary, 1995) to professional and instrumental (e.g., a new job or access to critical information) (e.g., Granovetter, 1995; Pittaway et al., 2004). Connections to others affect not only the opportunities a person has access to but also the length of life they have for taking advantage of those opportunities, with better-connected people generally living happier, healthier, and longer lives (Berkman & Syme, 1979; Holt-Lunstad et al., 2015).

A great social paradox faced by many people across the globe is that effectively establishing and utilising connections to others is both a fundamental human need and something that many people fail to do effectively. Functional benefits aside, to put the importance of this need into perspective, failing to achieve a sufficient sense of social connectedness can have consequences acknowledged to be worse for a person's health than obesity or heavy smoking (Holt-Lunstad et al., 2010).

The fundamental importance of HC perhaps explains why the subject has for decades captured the interest of scholars across a range of disciplines, from evolutionary anthropology and sociology to psychology and neuroscience. Such work has deepened our understanding of aspects of this far-reaching field, including: the origins of humans' need and ability to connect (e.g., Baumeister & Leary, 1995; Dunbar, 1998); the societal (Putnam, 1995), organisational (Murthy, 2017), social (Helliwell & Putnam, 2004), cognitive (Gardner et al., 2000), and neurological (Eisenberger, 2015) effects of HC deficiencies; the structure of connections and networks (Burt, 2007; Wellman, 1983); the stages or phases of connectivity (e.g., Knapp, 1978; Levinger, 1980); and how a sense (or lack) of connectedness might be measured (Aron et al., 1992; D. Russell et al., 1978). Early HC-related research was mostly concerned with understanding and explaining peoples' motivations to connect with others and the role of "human associations" in society (e.g., Maslow, 1943; Simmel & Hughes, 1949), with a focus on friendships, romantic relationships, and social group dynamics.

Human connectivity in organisations

Since around the 1970s, the importance of HC in organisations has been increasingly recognised, with many early social science theories having been adopted by organisations and applied to organisational settings. Obvious examples of this are the concepts of *socialisation* (Van Maanen & Schein, 1979), concerned with the way a person is socialised into an organisation; and *tie strength* (Granovetter, 1973) which considers the type of value derived from different categories of connections in a person's professional network. This recognition corresponds, perhaps uncoincidentally, to the transition from the so-called "industrial era" to the "information era" (Herr et al., 2019). With more people working together in offices

rather than on production lines, and with information being increasingly traded instead of raw materials, the connections between people in organisational settings were transformed and became arguably more important (Nurmi, 1998).

This early work showed that just as connections to others are critical for health, happiness, and prosperity in a person's personal life, so too do they play a critical role in the performance and general wellbeing of individuals in organisational contexts. It is often through their professional connections to others that a person gains access to ideas (Burt, 2004), information and resources (Whittington et al., 2009) as well as opportunities for professional advancement (Uzzi, 2019). Next to these functional benefits, better-connected people are generally happier and more satisfied in the workplace (Helliwell & Putnam, 2004), in part due to their reduced likelihood of experiencing loneliness at work, a challenge that some describe as having reached epidemic levels (Murthy, 2017). Organisations also benefit when their people are better-connected. For example, human connections play an important role in facilitating knowledge sharing (Hansen, 2002) as well as increasing productivity and innovation capability (Todo et al., 2016). And when people feel connected to the right people at work, attrition is reduced (Carboni et al., 2021).

While the *outcomes* (i.e., value in the form of opportunities and benefits) of connections to others at work are important as ever, the *process* of connecting to others in organisational contexts is arguably becoming increasingly difficult. As organisations continue to adapt to ever-changing market conditions fuelled by a broad range of geographical, political, technological, social, and economic trends, ways of working are changing (Boland et al., 2020) and workplaces have become increasingly diverse (Roberson, 2019). Traditional operational structures are being supplemented by less familiar agile and distributed ones, exemplified by the rise in project-based working and freelancing (Bentley et al., 2020). Consequently, many workplace connections are becoming shorter-term, more intense, and virtual (Hadley & Mortensen, 2021). Diversity in the workplace leads to people having to connect with others who are less familiar. This combination of factors means that people are increasingly working with dissimilar and unfamiliar others, for shorter periods of time, and with fewer opportunities to meet in person. Together, these factors make the establishment and utilisation of strong professional connections all the more

challenging. This highlights the need for new approaches to support people in satisfying their HC needs in what we refer to here as *contemporary work situations*, characterised by heightened unfamiliarity of people and context.

Although the importance of HC and the value derived from a person's professional connections are well established, prescriptive support of the HC process in professional contexts is lacking. What support there is tends either to stop at offering activity-level suggestions such as playing more golf (Gray et al., 2020), or it suggests specific tactics for individuals to improve their performance when engaging in networking such as "freshen your breath", "make eye contact", or "note the unusual" (Zack, 2019). Such advice places disproportionate responsibility for improving HC outcomes on individuals and does not adequately emphasise the role of contextual factors such as the design of an intervention (e.g., network event or onboarding process), a system (e.g., team or organisational structure and ways of working), or the physical environment in which work is done (e.g., office space), thus diminishing the role of the organisation in creating optimum conditions to support HC.

Lacking a nuanced understanding of HC, designers and practitioners in organisational contexts – referring to anyone "who devises courses of action aimed at changing existing situations into preferred ones" (Simon, 1996, p. 111), including managers, event organisers, human resource specialists, organisational design consultants, team leaders, and more – often frame HC objectives in abstract holistic terms such as "get everyone on the same page" or "break down the silos between department x and y". While such idioms and clichés may sound logical in their implication of an objective, they are suggestive at best and fail to provide the detail required for the articulation of a sound design brief. Designers and practitioners are forced to rely on assumptions, anecdotes, and personal experience in the generation of solutions to address these lofty HC challenges and in the evaluation of design activities to understand successes and failures. A structured and grounded approach to the way these designers and practitioners devise relevant courses of action, will surely improve not just the quality of HC outcomes but also the consistency with which they can be achieved and the certainty with which they can be evaluated.

Organisational situations of (most) interest

Addressing all organisational HC challenges is well beyond the scope of a single PhD. To narrow the scope of this research, we sought what Eisenhardt (1989) describes as "extreme cases" where the process of interest (i.e., HC challenges in organisational contexts) was likely to be more observable. We focused our attention on situations where "lack of familiarity" is a common denominator that relates not just to the types of people one encounters in contemporary work situations but also to the location, structure, and nature of work itself – i.e., the context of work.

Increased fluidity, flexibility, and diversity in the workplace mean that in many work situations people are having less contact with each other and the contact they do have is increasingly with people who are different to themselves (e.g., Bentley et al., 2020; Roberson, 2019). This combination of reduced contact and increased diversity accentuates what we refer to as *unfamiliarity of people*. Similarly, the increasingly fluid and distributed nature of work for many people (i.e., people working in agile ways and often not in traditional offices) mean that the norms that govern expected behaviour are less universally shared and understood (Spreitzer et al., 2017). This accentuates what we refer to as *unfamiliarity of context* (i.e., operational, cultural, and spatio-temporal unfamiliarity). Plotting work situations across these two dimensions (i.e., according to a person's familiarity with the *people* around them and the general *context* in which work is being done) reveals four general types of organisational situations that can help us to frame organisational HC challenges (Figure 1).

	Familiar	**Unfamiliar**
Unfamiliar	**'Home Away from Home'** Connecting with familiar people in an unfamiliar context. *e.g., project team working from client location.* 2	**Nobody's 'at Home'** Connecting with unfamiliar people in an unfamiliar context. *e.g., **experimental workplaces, co-working spaces, and multi-disciplinary conferences.*** 4
Familiar	1 **'Home Sweet Home'** Connecting with familiar people in a familiar context. *e.g., long-time colleagues in company established office.*	3 **'Stranger in Your Own Home'** Connecting with unfamiliar people in a familiar context. *e.g., new cross-functional project team in established office.*

CONTEXT (e.g., operational, cultural, and spatio-temporal)

PEOPLE (e.g., diversity, connection strength, and duration)

Figure 1: Situating this research in contemporary work situations

The first type of situation (1) labelled 'Home Sweet Home' refers to traditional organisational situations that are familiar to most people in terms of the other people they are working with and where and how work is done. In such situations "the way we do things around here" is well established. The second type of situation (2) labelled 'Home Away from Home' refers to situations in which people are working with familiar others but in an unfamiliar context. A common example is a project team who already know each other working offsite (i.e., "on location"). The third type of situation (3) labelled 'Stranger in Your Own Home' refers to situations in which people are working in a familiar context (e.g., the office they've always worked at) but with unfamiliar others. A common example here is a new project team made up of people from various departments, international offices, or members of the client organisation. The fourth type of situation (4), and the one highlighting the focus this work, is labelled 'Nobody's 'at Home". Such situations are characterised by

unfamiliarity of both context *and* people. These situations – which we refer to as *contemporary work situations* – are exemplified by the likes of **experimental workplaces**, **co-working spaces**, and **multidisciplinary conferences**.

While the degree of familiarity of all people is not constant within each of the four quadrants (e.g., a long-term member of a coworking space is likely to be more familiar with the operational aspects of the space than a new member), each quadrant represents a distinct set of HC challenges. The contemporary work situations exemplified in the fourth quadrant (i.e., experimental workplaces, co-working spaces, and multi-disciplinary conferences) represent examples of increasingly prevalent services, experiences, and business models intended to disrupt convention or cater to changing market needs.

Unfamiliarity of *context* is common in many experimental workplaces such as innovation labs and 'smart' spaces, for example, which are deliberately separated from the main organisation so that people feel more liberated in their approaches to solving problems and identifying opportunities (Rigby, 2015). Similarly, many co-working spaces and the rules that govern them are distinctly (and deliberately) different from traditional office contexts (Spinuzzi, 2012) to create a more relaxed working environment. And finally, there is a growing trend of multi-disciplinary conferences situated in unfamiliar venues, deliberately different from traditional hotels and conference centres. For example, C2 (https://www.c2montreal.com) takes place in a disused industrial factory building in Montreal and the DO-lectures (https://thedolectures.com) take place on a remote dairy farm in Wales.

Unfamiliarity of *people* is also heightened in these examples of contemporary work situations. Driven by the understanding that diversity is a key driver of innovation and creativity (Baer, 2010; Lungeanu & Contractor, 2014), many experimental workplaces (e.g., innovation labs) deliberately bring together people from different backgrounds and disciplines across the organisation. Similarly, co-working spaces commonly attract people from different backgrounds, disciplines, life- and career-stages (Spinuzzi, 2012). And finally, multi-disciplinary conferences are purposefully designed to bring together diverse groups of people. According to C2 Montreal, "The future of business takes place at the creative intersections of commerce, science, technology, society and sustainability"

(https://www.c2montreal.com – 'Why Attend'). Thus, in all three example situations people are more likely to be interacting with others who are not like them, across a range of potential dimensions.

In summary, the "extreme cases" selected as the focus of this research (i.e., experimental workplaces, co-working spaces, and multi-disciplinary conferences) represent increasingly common examples of contemporary work situations where people are less able to rely on familiar contextual cues to guide behaviour and are more likely to have to connect with others who are not like themselves. In addition to HC challenges likely being more observable in these cases, we anticipate that a design support created to support designers in these extreme cases might be more likely to also provide HC design support in the other, less extreme situations described in Figure 1.

Human connectivity in design: the opportunity for a distinct field of research and practice

Given the scale of the HC challenges faced by so many people in both personal and professional aspects of their lives one would expect design to play an active role in improving the HC process to deliver improved and more consistent HC outcomes. However, while design often indirectly addresses HC or uses HC for other objectives, it seldom features as an explicit objective of design research. Rather, HC features more commonly as an input of another design activity or in supporting other design knowledge. For example, in their "Wheel of Joy in Life", Holtzblatt and Beyer recognize "Connection" as one of the four Cool Concepts that "define how cool products touch our core human motives" (Holtzblatt & Beyer, 2016, p. 11). Relatedness, defined as "feeling that you have regular intimate contact with people who care about you rather than feeling lonely and uncared for", is recognised as one of the six critical psychological needs that, when satisfied through design interventions, deliver positive and personally meaningful experiences (Hassenzahl et al., 2013, p. 22). Strengthening human relationships, which enables creativity and learning, is proposed as one of five systemic design principles in social innovation (van der Bijl-Brouwer & Malcolm, 2020). And, as a final example, social cohesion and meaningful encounters, enhanced by elevating an individual's sense of vulnerability

(Cipolla, 2018), are recognised as critical components in the successful creation of socially resilient place-based communities (Manzini & Thorpe, 2018). One example of a process-based approach to design for human connectivity is seen in a study of a successful networking event that identifies six design principles to improve connectivity outcomes (Mandeno & Baxter, 2021).

While these examples illustrate how HC is recognised as important by some design researchers and practitioners, limitations prevent wider innovations to improve HC outcomes. Firstly, design for human connectivity (DfHC) lacks attention. Human connectivity generally features as a "means" rather than the "end" of design research or practice. That is, HC is acknowledged in the pursuit of other design objectives rather as an objective in itself. Secondly, DfHC lacks context. Most research takes a snapshot of existing connections and fails to acknowledge the broader journey a connection takes from its inception through to fruition or eventual termination. Moreover, the snapshots taken tend to favour connections that are in development or already established. Much of the process of connecting is taken for granted, particularly the initial phase(s). And thirdly, DfHC lacks structure and direction. There is a notable lack of frameworks and tools to guide HC design practice. Practical HC design activities are often not grounded in research. Rather, the plethora of (generally speculative) design interventions to improve HC outcomes tend to rely on past experience, assumptions, and anecdotal evidence to guide decision making. Extant literatures emphasise the importance and value of human connections and their role in achieving other outcomes but generally do not go so far as prescribing how the HC process might be enhanced. This combination of deficiencies (i.e., of attention, context, and structure) restrict the formalisation and growth of DfHC as a distinct field of design research and practice, thus also restricting the required innovation in HC solutions.

Formalising and growing DfHC as a distinct field of design research and practice is the central objective of this thesis. Achieving this objective means addressing the three aforementioned deficiencies. It requires that designers and practitioners consider HC as an end, not just a means of achieving other outcomes. It requires a deeper understanding of the journey connections take and the contexts in which connecting occurs, in order to effectively scope HC challenges. It requires the

development of frameworks and tools that support both generative and evaluative HC design activities, creating meaningful interventions that lead to greater quality and quantity of human connections and provide a means of understanding successes and failures of those activities.

In the next section, the aims, objectives, and structure of the thesis are established. Thereafter, the philosophical worldview, methodology and methods are described, followed by the contributions of this work and a thesis outline.

1.1. Research aim, objectives, and thesis narrative

The central aim of this research is to begin the formalisation of DfHC: recognising and situating HC as a distinct field of design research and practice; contextualising and deepening our understanding of HC challenges; and, developing a design support to support both generative and evaluative design activities. This aim is achieved through three general phases of work (summarised in Table 1 and visualised in Figure 2), each guided by a distinct yet interconnected set of objectives and corresponding research questions explained in more detail thereafter.

Table 1: Research phases, objectives, and corresponding thesis chapters

Research phase	Objective	Chapter
Phase 1: Research clarification and situating DfHC.	A. Review and articulate the current state of the art of HC research including its adoption and application in design research and practice. Formulate realistic and worthwhile research goal.	two
Phase 2: Deconstruction and analysis to support and deepen understanding.	B. Identify the distinct phases of the HC journey at an objective-focused and activity-based level to support design activities.	three
	C. Interrogate the first phase of the HC process where connections are initiated, to derive the tactics that may be adopted in achieving this phase.	four
	D. Identify and understand the elements of relevant organisational settings that explain HC outcomes.	five
	E. Derive the barriers and enablers to HC in contemporary work situations.	six
Phase 3: Synthesis: support generation, application, and evaluation.	F. Develop, apply (in the field), and evaluate a design support that supports both generative and evaluative design activities to address real HC challenges.	six

Introduction
Ch.1

PHASE 1
Research clarification
and situating DfHC.

Situating Design for
Human Connectivity
Ch.2 / Lit.Review

PHASE 2
Deconstruction and
analysis to support and
deepen understanding.

HC Process: The
Connector's Journey
Ch.3 / Lit.Review

Finding Tactics
Ch.4 / Studies 1a & 1b

Behaviour Settings
Ch.5 / Study 2

HC Barriers & Enablers
Ch.6 / Study 3a

PHASE 3
Synthesis: support
generation, application,
and evaluation.

Design Prompts
(Generation)
Ch.6 / Study 3a

Design Prompts
(Application & Evaluation)
Ch.6 / Study 3b

Discussion & Conclusions
Ch.7

Figure 2: Schematic overview of the thesis

1.1.1. Phase 1: Research clarification and situating DfHC

The objective of this exploratory first phase of research is to review and articulate the current state of the art of HC research including its adoption and application in design research and practice. Due to the universality and broad generalisability of fundamental HC principles, this review consults a diverse range of literatures. Emphasis is placed on literatures that support understanding of HC in contemporary work situations – the focus of this work. In addition to framing the research, this phase seeks to establish the research goal as being worthwhile and realistic.

The research questions guiding this phase and the pursuit of our first objective are:

a) How is HC contextualised in research and practice and how does this support the scoping of HC challenges?

b) What are critical HC challenges in contemporary work situations and what is driving these challenges?

c) What motivates people to connect in contemporary work situations and how effective are people in satisfying their professional HC needs?

d) How is the HC process framed and understood, and how does this framing and understanding support the scoping of HC challenges?

e) How does the current knowledge base support HC-related design activities? What are the gaps?

f) How are HC outcomes measured?

Addressing these research questions in this exploratory phase reveals a clear opportunity, and arguably a necessity, to develop DfHC as a distinct field of design research and practice, addressing increasingly prevalent and complex HC challenges. Existing knowledge regarding the importance of HC in people's personal and professional lives and the general increased prevalence and complexity of HC challenges confirms developing DfHC to be a worthwhile research goal. Deficiencies are identified in the current scoping of HC challenges, the framing and understanding of the HC process, and in the measurement of HC outcomes. This provides clear direction for an initial programme of descriptive research to address these critical gaps and establish a foundation to support both generative and evaluative HC design activities.

1.1.2. Phase 2: Deconstruction and analysis to deepen understanding

Having situated DfHC, framed the research, and confirmed the research goal, this second phase of research is guided by four objectives (B, C, D, and E - Table 1), each aimed at addressing an important knowledge gap.

The first gap addressed in this phase is the lack of a suitable framework mapping the journey of one person connecting to another. Although there are many descriptions of processes of people connecting in the literature (e.g., Altman & Taylor, 1973; Knapp, 1978; Levinger, 1980), these tend to be context-specific research frameworks less suited for design due to their general lack of support for the goal-directed HC actions of a person. The corresponding objective (B) here is to derive the distinct phases of a person's journey through the HC process according to the unique objectives, activities, and related requirements in each phase. Research questions are:

a) What are the distinct phases of the HC process according to a person's objectives and activities in each phase?

b) What are the requirements for the successful attainment of each phase?

c) How do the phases relate to one another?

When deriving the phases of connectivity, patterns emerge for each phase. Finding a person to connect to is a critical phase of connectivity that is often neglected in existing frameworks yet has particular potential to impact design outcomes if adequately understood. Addressing this gap, our next objective (C) is to interrogate the Finding phase, to identify a finite list of tactics a person can employ in finding someone to connect to. Related research questions are:

a) What are the unique tactics people may adopt in finding others to connect to?

b) What are the requirements for the successful execution of each tactic?

c) How does the Finding phase relate to the other phases?

Understanding how connections are initiated and the distinct objectives and actions of people in each phase of the connectivity journey provides much needed support for more nuanced scoping of HC challenges. Challenges may now be framed at the phase-level (e.g., "support people in initiating connections") rather than simply the overall-level (e.g., "improve a person's sense of relatedness to others").

Having established a HC process framework better suited to supporting design, our attention shifts to investigating the individual, social, and contextual factors that

can positively or negatively influence the HC process. This is achieved through studies of contemporary work situations perceived as extreme cases (Eisenhardt, 1989), where HC challenges are likely to be more observable. The cases selected are experimental workplaces, multi-disciplinary business conferences and co-working spaces. The objective (D) of the first study is to identify and explain the elements of a setting that influence HC outcomes. This is achieved through a detailed setting-level evaluation of the effectiveness of four unique interventions intended to deliver positive HC outcomes to participants in experimental workplaces and multi-disciplinary conferences. As well as interrogating the target settings to derive a detailed understanding of the elements of those settings that influence HC outcomes, this work also suggests how modifications to some settings might improve them. Specific research questions are:

  a) What elements of a setting influence HC outcomes, either positively or negatively?
  b) How are relevant elements of a setting interconnected?
  c) What changes to a setting are likely to improve HC outcomes?

The next objective (E) is to derive the factors (framed as barriers and enablers) that influence the HC process in co-working spaces, another contemporary work situation. This work represents the first step toward the development of a design support described in more detail below. Research questions for this part of the study are:

  a) What are the barriers and enablers to HC in co-working spaces?
  b) How do these factors influence the HC process and outcomes?
  c) What are the mechanisms that explain these barriers and enablers?

The focus is on the experience of individuals seeking to meet their day-to-day professional HC objectives in co-working spaces. Results highlight a range of individual, social, and contextual factors that can influence the HC process.

1.1.3. Phase 3: Synthesis: support generation, application, and evaluation

Prior phases of research provide a deep and nuanced (i.e., contextualised and process-level) understanding of how HC challenges can be scoped and the factors that can support or undermine design efforts to improve HC outcomes. Grounded in this new knowledge, the final phase of research focuses on the creation of a new design

support to support HC design activities. Our final objective (F) is to develop and apply (in the field) a design support that supports both generative and evaluative design activities to address real HC challenges. The research questions that guide this final phase of work are:
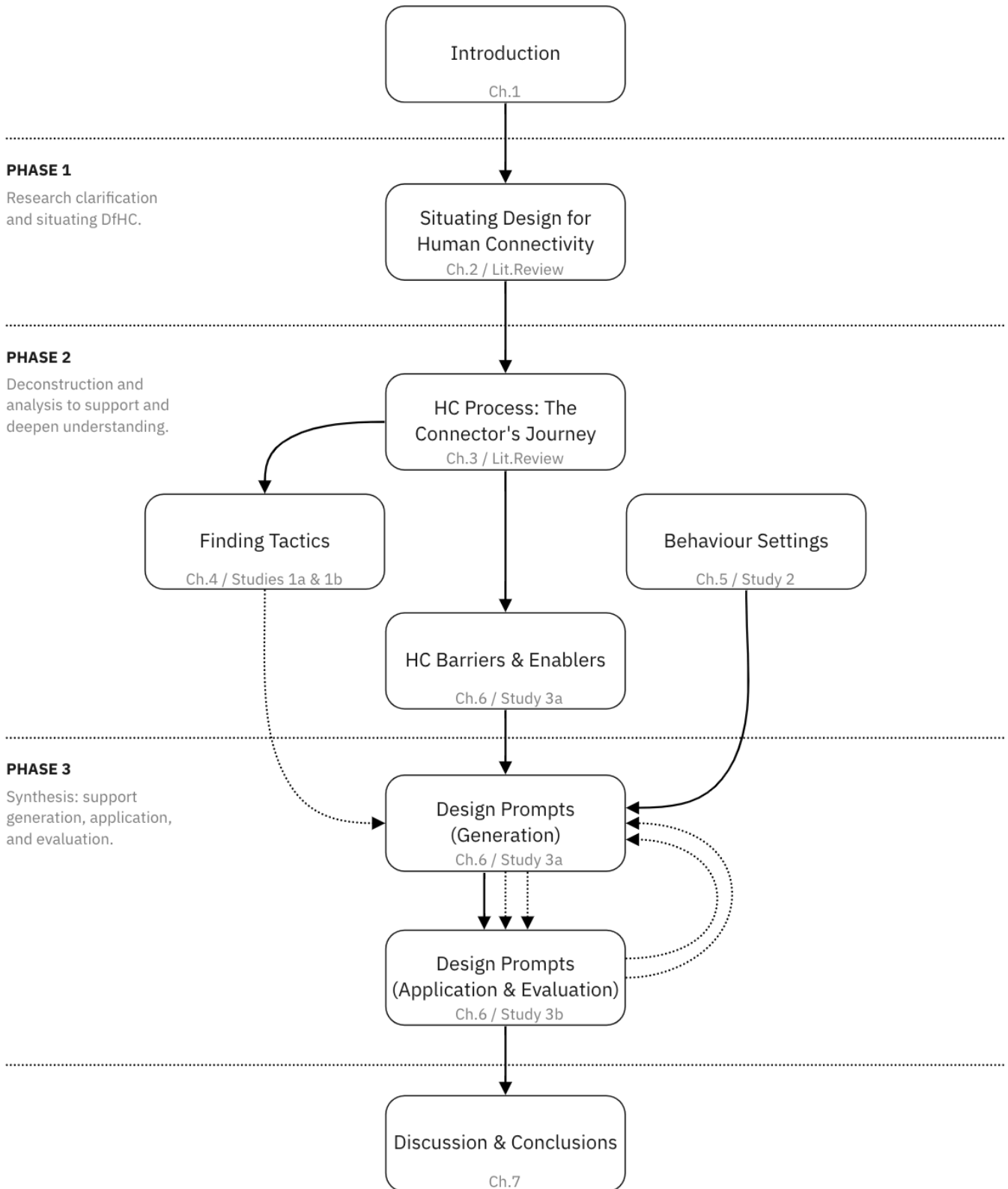
a) How can the generalisable mechanisms identified in earlier research (i.e., evident in barriers, enablers, and setting elements) be synthesised to guide the development of a design support to support generative and evaluative HC design activities?

b) What is the ideal form of the design support and how should it be used?

c) What is the usefulness of the design support?

d) How usable is the design support and in what contexts?

The design support is developed and applied in three unique real-world contexts, supporting generative as well as evaluative design activities. The usefulness of the design support across the three contexts provides confidence as to its generalisability to other contexts although more research will be required to confirm this. Implications for designers and practitioners are discussed and suggestions are made for future research.

1.2. Research worldview, methodology and methods

The four elements of the research process are methods, methodology, theoretical perspective, and epistemology, defined by Crotty (1998, p. 3) as:

- *"Methods*: the techniques or procedures used to gather and analyse data related to some research question or hypothesis.

- *Methodology*: the strategy, plan of action, process or design lying behind the choice and use of particular methods and linking the choice and use of methods to the desired outcomes.

- *Theoretical perspective*: the philosophical stance informing the methodology and thus providing a context for the process and grounding its logic and criteria.

- *Epistemology*: the theory of knowledge embedded in the theoretical perspective and thereby in the methodology."

Crotty presents these elements in what he refers to as a "scaffolding" where each element informs the next in ascending order. In this section, these elements are presented in reverse order as they relate to the current project.

1.2.1. Epistemology and philosophical stance (theoretical perspective)

Identification of an epistemological position grounds the research according to what kinds of knowledge are possible, adequate and legitimate (Maynard, 1994, in Crotty, 1998). The major epistemological positions that inform theories of design research are objectivism, constructionism and subjectivism (Feast & Melles, 2010). Crotty (1998) separates these three positions based on their understanding of the derivation of meaning. *Objectivism* "holds that meaning, and therefore meaningful reality, exists as such apart from the operation of any consciousness" (p. 8). *Constructionism* holds that there is no objective truth, but rather, "truth, or meaning, comes into existence in and out of our engagement with the realities in our world" and "meaning is not discovered but constructed" (p. 8-9). And finally, *subjectivism* holds that "meaning does not come out of an interplay between subject and object [as is the case with constructionism] but is imposed on the object by the subject" (p. 9). The subjectivist view that focuses on design practice rather than the systematic application of methods and that "elevates the designed artefact to the status of research" (Feast, 2010, p. 5) rules out subjectivism as the epistemological position of the current research. Further consideration of objectivism and constructionism is warranted.

Objectivism is most commonly associated in design research with a post-positivist philosophical stance. Post-positivism "has the elements of being reductionist, logical, an emphasis on empirical data collection, cause-and effect oriented and deterministic based on a priori theories" (Creswell, 2007, p. 20). As described by Easterby-Smith et al., (2012) defining characteristics of a positivist stance are: "the observer must be independent; human interests should be irrelevant; explanations must demonstrate causality; concepts need to be defined so they can be measured; and generalisation is achieved through statistical probability" (p.24).

Social constructionism, on the other hand, is the most common philosophical stance of the constructionist epistemology in design research. In explaining the *social* nature of this philosophical stance, Crotty (1998) stresses the importance of culture

in the emergence of human thought. That is, most things people encounter and make sense of are not done in isolation. Rather, "when we first see the world in meaningful fashion, we are inevitably viewing it through lenses bestowed upon us by our culture" (Crotty, 1998, p. 54). In drawing a comparison with the positivist stance described above, Easterby-Smith et al., (2012) list the following defining characteristics of a social constructionist stance: "the observer is part of what is being observed; human interests are the main drivers of science; explanations aim to increase general understanding of the situation; concepts should consider stakeholder perspectives; and generalisation is achieved through theoretical abstraction" (p.24).

Although some quantitative methods – historically closely linked to positivism (Robson & McCartan, 2016) – were used in this research (i.e., the surveys in study 1 / chapter 4), the essence of the research presented in this thesis clearly adopts a social constructionist philosophical stance. Firstly, it was not assumed that there was a singular absolute truth that explained HC, nor was one sought. Secondly, rather than taking an objective position and maintaining complete independence from the object of study, as is a key assumption of positivism (Easterby-Smith et al., 2012), the approach taken in this project often involved immersion in the contexts being studied. This was most evident in the behaviour settings work (chapter 5) where I participated in three of the settings of interest.

1.2.2. Methodology and methods

The three phases of research (as described in section 1.1) are inspired by the first three phases of the Design Research Methodology (DRM) (Blessing & Chakrabarti, 2009) and employ a mix of qualitative and quantitative methods . The DRM is "a generic design research methodology that links the research questions together and provides support to address these in a systematic way" (Blessing & Chakrabarti, 2009, p. vi), adding structure and rigour to design research. The DRM considers design as a phenomenon, rather than simply a process, and advocates addressing all facets of the phenomenon including artefacts, people, tools, processes, organisations and the environment in which activities take place (Blessing & Chakrabarti, 2009). Although primarily intended for engineering and industrial design research, the iterative and

circular framework of the DRM lends itself to a broader range of design research domains including the current project.

In addition to the general methodological structure of DRM, parts of this research are also inspired by two additional methodologies – namely Research Through Design (Stappers & Giaccardi, 2017) and Behaviour Centred Design (Behaviour Settings Theory) (Aunger & Curtis, 2016). Research Through Design refers to a form of learning by doing, or specifically, "design activities that play a formative role in the generation of knowledge" (Stappers & Giaccardi, 2017). Behaviour Centred Design is grounded in behaviour change and offers "a practical process for designing and evaluating interventions" (Aunger & Curtis, 2016, p. 2).

This project employed mostly qualitative methods with the exception of the surveys employed in studies 1 and 3b. Research methods were selected for each study based on the type of information sought, the target audience, and the circumstances (Robson & McCartan, 2016). An overview of research methods is provided in Table 2 below and described in more described in each respective chapter.

Table 2: Overview of studies and research methods

Research Step	Study	Method(s)	Chapter
Situating DfHC	-	Literature review	two
HC Process: The Connector's Journey	-	Snowballing literature review and abductive synthesis	three
HC Finding tactics	1	Questionnaire Survey	four
Behaviour settings	2	Observations Semi-structured interviews Behaviour setting canvas	five
HC barriers and enablers	3a	Semi-structured interviews Observations	six
Design Prompts	3b	Workshops Observations Discussions Survey	six

1.3. Contributions

This thesis makes six main contributions summarised below. Other relevant but minor contributions are presented at the end of respective chapters.

The first and overall contribution of this thesis is the *formalisation of DfHC* as a distinct field of design research and practice. While volumes of research exist that support understanding of various aspects of HC, this knowledge has, to date, not been organised in a structured way that supports design and provides a design research agenda. This work elevates the subject of HC from its current position as an input to other design activities. Design for human connectivity is situated as providing a critical bridge between an expansive extant knowledge base and an increasingly complex and challenging environment.

The second main contribution is the *unfamiliarity matrix* (chapter 2) that positions organisational situations according to the degree of familiarity people feel toward others and the general work context. This simple matrix organises work situations into four general categories, supporting designers and practitioners in understanding the origins and types of HC challenges typical in each.

The third main contribution is the deconstruction of the HC-process into a 5-phase framework suited to supporting design (chapter 3). The five phases are: Finding, (trans)Forming, Maintaining, Leveraging, and Disconnecting. We refer to this framework as the *Connector's Journey*, where the Connector is the protagonist in a connecting dyad. This new framework makes a valuable addition to existing HC process frameworks that are generally overly context specific, focused on just a part of the HC process, and/or framed from the researcher's perspective in their description of what is happening rather than the objectives of the connecting individual(s) and what they are doing. The activity-based nature of this new framework specifies the phase-level objectives of people as they progress through the HC process. This nuanced detail can aid scoping of HC challenges and support designers in focusing on a specific phase of the process rather than, as is currently the case, seeing HC as a singular overall experience.

The fourth main contribution is the derivation of the tactics a person may adopt in achieving *Finding* – the first and arguably most important and equally

overlooked phase of the HC process (chapter 4). This research determines that Finding may be achieved by Stipulated, Sought, Suggested, Seduced, or Serendipitous means. The articulation of these five tactics is important for design activities that aim to support people in initiating connections to each other. The specificity provided by this nuanced understanding of Finding highlights how a design solution may be specifically tailored to characteristics of connecting individuals and the context.

While not a primary objective of this work, a fifth main contribution facilitated by this research is the co-creation and iterative prototyping of the *Behaviour Setting Canvas* together with with collaborators (chapter 5). Behaviour settings theory is well established but, like other aspects of HC, was not framed or structured in a way that made it readily applicable in design research and practice. The behaviour setting canvas communicates behaviour setting theory in a form familiar to designers, visually representing all the elements of a setting that help explain behaviour and making the relationships between elements more obvious. Application of the behaviour setting canvas in four settings highlights how a broad variety of elements can contribute to HC outcomes in settings where HC is an expected and desired outcome. The unexpected nature of many of these insights reinforces the tendency of designers and practitioners to overlook often simple but critical elements that can affect HC outcomes, either positively or negatively.

The sixth and final main contribution of this thesis is a tool – namely a set of *19 design prompts* – to support DfHC (chapter 6). The prompts are applied in three real world cases where they are shown to help designers and practitioners be more creative and collaborative in generative as well as evaluative HC design activities. Each prompt includes a guiding question and an explanation. The guiding questions allude to potential challenges or opportunities, thus provoking deeper and wider contemplation. The explanations, grounded in the knowledge base, help to frame the prompts and support understanding of their origin and relevance. Offering designers and practitioners a comprehensive range of unique prompts stimulates thinking beyond the obvious. Together, the prompts provide a useful structure and consistent vocabulary to support collaboration. Successful application of the prompts in the field, together with positive feedback from participants in all three cases attests to their usefulness and usability. The diversity of contexts in which the prompts were

applied provides confidence as to their generalisability to other contexts although further application is required to validate this.

1.4. Thesis outline

The structure of this thesis follows the phases and studies presented earlier in Figure 2 and comprises seven chapters, including this introduction chapter. In Table 3 on the next page, a brief description of the contents of each chapter indicates what the reader can expect.

Table 3: Structure and contents of this thesis

Chapter	What to expect
One	Introduction (this chapter).
Two	A review of the literature that helps to situate DfHC between an existing knowledge base and an environment that reflects increasingly complex HC challenges.
Three	Review of relevant literatures followed by abductive development and presentation of new activity-based and objective-focused framework of the HC process – *The Connector's Journey*.
Four	Presentation of two studies in which *Finding* – the first phase of the Connector's Journey – is interrogated to derive the five tactics people may adopt in finding others to connect to.
Five	An in-depth analysis of four contemporary work situations using behaviour settings theory and methods. Presentation of the elements of those settings recognised as affecting HC outcomes.
Six	**Part a:** Derivation of factors that influence the HC process. Synthesis of these factors, together with behaviour settings elements (chapter 5) and other general insights, to create a design support (19 design prompts) to support generative and evaluative DfHC activities. **Part b:** The design support is applied in the field and its usefulness and usability are evaluated and reported.
Seven	General discussion and conclusions of this work. Implications for designers and practitioners are considered, contributions are highlighted, and suggestions are made for future research.

2. Design for Human Connectivity: Toward a distinct field of design research and practice

"By formalizing the knowledge about the types of content, it is easier to include people from different fields and remove confusion amongst designers about the meaning of value, or the required competencies, or the users' aspirations, and other important but abstract ideas."

(Whitney & Nogueira, 2020, p. 152)

Human connectivity – both the *process* of connecting and the *outcomes* people derive from their connections to others – is fundamental to the social operating system that makes life possible and enjoyable. Connections to others act as critical conduits to all manner of benefits from a deeply emotional sense of belonging to purely functional access to resources. Despite the importance of connections to others, many people struggle to effectively establish and sustain the connections they need to live happy, healthy, and prosperous lives. This challenge appears to be growing, evident in the so-called "loneliness epidemic" in many cultures and organisations (e.g., Khullar, 2016; Murthy, 2017).

The outcomes people derive from their connections to others and explanations for the pursuit of those outcomes are well researched and documented across a diverse range of disciplines. Meanwhile, the HC process is less well understood. Volumes of work theorise and describe in much detail the motives that drive people to connect, the benefits derived from connections to others, and the detrimental effects of failing to satisfy a person's connectivity needs (e.g., Baumeister & Leary, 1995; Holt-Lunstad et al., 2010; R. M. Ryan & Deci, 2000). Other work explores the structures of connections (e.g., Burt, 2000), and how various HC outcomes can be measured (e.g., Aron et al., 1992; D. Russell et al., 1978). This all occurs against a backdrop of constantly evolving geographical, political, technological, social, and economic forces that influence the types of connections people need, how connecting happens, and what people expect from their connections (e.g., Bentley et al., 2020).

Design is well positioned to address growing HC challenges and maximise HC opportunities by supporting designers and practitioners in taking a more structured and informed approach to the scoping of HC challenges, the creation of solutions that meet the HC requirements of people in changing environments, and the evaluation of design outputs. Achieving this, however, justifies and demands recognising HC as a distinct field of design research and practice. This contrasts with the current situation in which HC is often a means to other design ends, an accidental by-product of the pursuit of other design objectives, an afterthought, or simply neglected.

Formalisation of HC as a distinct field – *Design for Human Connectivity* (DfHC) – will help to structure and align concepts borrowed from adjacent research domains; clarify the aspirations and needs of users; support designers in prioritising activities according to where they can add value; and specify required competencies to address challenge and opportunity areas (Whitney & Nogueira, 2020). As such, formalisation of DfHC will provide much needed support to designers and practitioners who currently often rely on intuition, past experience, and anecdotal evidence to inform decision making. This formalisation would position HC as a core objective of design, direct strategic thinking and decision making when scoping design challenges, and support both generative and evaluative design activities by grounding such activities in the existing knowledge base. Formalising DfHC will also add rigour to this exciting field of research and practice, facilitating the generation of new knowledge.

In this chapter, DfHC is positioned as a distinct field of design research and practice. In the first section (2.1), a framework is presented that situates DfHC between a complex and ever-changing environment and a vast and insight-rich knowledge base. The next section (2.2) acknowledges how aspects of the HC environment can support scoping of design activities based on the contexts in which design solutions are applied and the level of analysis being considered. Here the challenges that are influencing HC needs and objectives are also described. Next (2.3) relevant aspects of the HC knowledge base are reviewed to highlight examples of practical expertise and design artefacts that provide invaluable support to the theoretical understanding of HC and what works in the field. Finally, prior to discussing and concluding this chapter, the next section (2.4) suggests an approach to

DfHC research, introducing a research agenda and highlighting the parts of that agenda addressed in this thesis.

2.1. Situating design for human connectivity

Design science research – referring to "a research strategy aimed at knowledge that can be used in an instrumental way [in contrast to a conceptual way] to design and implement actions, processes or systems to achieve desired outcomes in practice" (van Aken et al., 2016, p. 1) – is well placed to bridge the gap between what is known (i.e., existing knowledge) and what is needed (i.e., the environment and the challenges it represents) (Hevner, 2007). Conducted with suitable rigour, design science research will not only address the challenges at hand, but will, in doing so, also generate and contribute new knowledge to the knowledge base.

Design science research comprises many frameworks to support knowledge generation. One such framework that is useful for generating a schematic representation of DfHC (Figure 3) is Hevner's 'design cycles framework' (Hevner, 2007, p. 2). Design for human connectivity (the middle box) consists of interrelated generative and evaluative activities that produce "a specific solution to be applied in the world" (Stappers & Giaccardi, 2017). These activities require an understanding of the HC environment and should be grounded in HC knowledge. The HC environment helps contextualise challenges to ensure relevance in how HC design (research) questions are defined and tested. The HC knowledge base consists of scientific, design, and practitioner know-how that ensures rigour within the design process. This framework guides the scoping of HC challenges and the application of HC knowledge to support design research and practice.
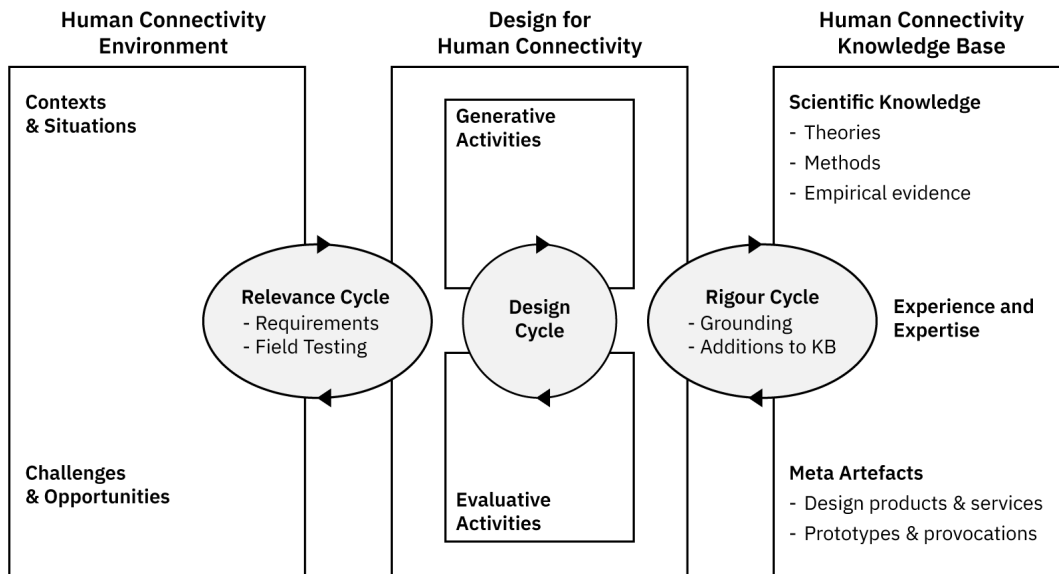
Figure 3: A 3-cycle framework for DfHC – adapted from Hevner's design science research cycles (Hevner, 2007, p. 2)

The HC environment acknowledges where and for whom a design output will be applied to meet a specific objective. As such, the environment supports scoping activities that specify the requirements of a solution given the context within which it is applied. For a solution to have a positive impact in the environment, it must address a real challenge or realise a real opportunity. This necessitates an understanding of the forces that are the source of such challenges and opportunities. The relevance cycle represents what Simon (1996) refers to as the interface between the "inner" environment – i.e., "the substance and organisation of the artefact itself", and the "outer" environment – i.e., "the surroundings in which it operates" (p. 6). If there is congruity between the inner and outer environments, the artefact (i.e., the solution) will serve its intended purpose. The relevance cycle therefore relates to the generative and evaluative design activities that communicate the specific requirements of a solution and provides a means of measuring the solution's effectiveness when applied in the field.

Grounding DfHC research and practice in the existing knowledge base adds rigour to the work, ultimately improving its potential efficacy. Existing knowledge may comprise theories, methods, and evidence that ground, inform, and guide design activities. Much can also be learned from the experience and expertise of specialists in the field (i.e., designers and practitioners) as well as from artefacts that have shown

to work but are not necessarily empirically tested (i.e., products, services, prototypes, and experiments). The rigour cycle supports the grounding of design activities in the knowledge base and ensures that design activities produce "research contributions and not routine designs" (Hevner, 2007, p. 90).

Growing DfHC as a distinct field of design research and practice can support designers and practitioners in creating solutions that address pressing challenges and opportunities to improve HC outcomes across a range of contexts. The DfHC framework (Figure 3) proposes a structured approach to achieving this objective through the alignment of existing research and practice in supporting both generative and evaluative design activities. This framework enables both broad and narrow scoping of projects, from overall connectivity across a population to the individual connectivity experience of a dyad in a particular context.

To limit the scope of this thesis, the primary focus is on dyadic connections within contemporary work situations. Despite this focus, we acknowledge that much of the process and value of HC is generalisable across contexts, both within organisations and between professional and personal settings. The prevalence of personal social connections such as romantic partnerships that emerge from professional work contexts (e.g., Wilson, 2015) highlights this blurry contextual boundary. In recent years it has become more difficult to draw clear boundaries between distinct personal and professional contexts as today tasks seem to flow "across place, time, and devices" (Holtzblatt & Beyer, 2016, p. 9). The blurriness of this distinction has only increased as a result of the COVID-19 pandemic, with many more people working at least partly from somewhere other than a traditional office. Consequently, this work draws on and speaks to relevant knowledge derived from related and adjacent contexts.

The next two sections of this chapter present a review of relevant literatures relating to the HC environment and knowledge base respectively. Together, these sections support understanding of the challenges and opportunities DfHC is poised to address and the existing knowledge in which design activities may be grounded.

2.2. The human connectivity environment

Human connectivity is a broad concept and when dealt with as such it can be difficult to create specific and effective design interventions. A narrower view of HC can be scoped through defining clear design challenges and opportunities. These challenges and opportunities may be framed relative to the contexts in which connections occur and the level of analysis and application. There are two general contexts in which connections are mostly considered, namely *organisational* and *societal* contexts. Connections within organisational contexts are generally referred to as "professional" (or "work") connections (e.g., colleague, client, boss) and in societal contexts as "personal" (or "social") connections (e.g., friend, partner, roommate). As alluded to in the previous section, the boundary between these two categories is often blurry. This is explained in part by "the interdependent nature of knowledge and service work [which] is altering how we form and maintain relationships in organisations, blurring the distinction between colleague and friend" (Pillemer & Rothbard, 2018, p. 636). This distinction does, however, acknowledge how institutional structures and requirements influence HC needs, processes, and outcomes.

2.2.1. Challenges affecting human connectivity needs and outcomes

While on the one hand recognising the importance of HC in organisations, and generally in society, researchers also posit that in the past few decades the connective tissue that built and maintained strong cohesive communities in earlier times is being strained to breaking point (Cacioppo et al., 2009; Luna & Holt-Lunstad, 2019; Putnam, 1995). Media reports point to increasingly polarised societies (e.g., Noor, 2020; Yudkin et al., 2019) and an epidemic of social isolation and loneliness in society at large but also in organisations (Khullar, 2016; Murthy, 2017). Meeting a person's HC objectives in the workplace is, it seems, becoming increasingly difficult.

The difficulties people face in meeting their workplace HC objectives may be partly explained by considering a range of seismic geographical, political, technological, social, and economic changes that are affecting the way people live and work. Four specific changes that help explain continued and growing HC challenges, primarily in organisational contexts, but also often in societal contexts,

are: migration, digitisation, optimisation, and decentralisation. In this section, each of these changes is introduced and its impact on HC is explained.

Migration

In pre-industrial times the experience of connecting to others was arguably simpler and therefore potentially less daunting. Most people lived and worked in small rural communities and migration between villages, towns, regions, and nations was limited for economic and practical reasons. Consequently, the people someone encountered on a daily basis would mostly have seemed familiar. Since the industrial era however, people have been on the move in large numbers, by choice or by force. Around 1800, less than 2% of the population of advanced nations lived in urban areas (Davis & Golden, 1954). In 2018, the percentage of people living in urban areas had risen to 55% and this figure is projected to reach 68% by 2050 (United Nations, 2019). Not only were people moving from rural villages to cities but the prevalence of travel between countries and regions soon also grew rapidly. For example, beginning around 1850, tens of millions of Europeans left for what they saw as sparsely populated, resource-rich countries on other continents such as the Americas and Africa (Hatton & Williamson, 1998). Migration continues to this day. For example, in 2020 there were over 15 million European citizens living in a country other than their country of birth (Koikkalainen, 2021). In the United Kingdom, over 3.3 million people moved to a different local authority in the 12-month period to mid-2019 (Chen et al., 2020).

The impact of migration on the HC process and outcomes is significant for two reasons. Firstly, as more people move, both they and those they encounter at their destination are increasingly surrounded by others who are less familiar. Increased diversity means that the norms guiding connectivity-related behaviour may not be as clear, particularly when moving across regional, national, or organisational boundaries. Given the general human tendency to treat outgroup others less positively than ingroup others (Tajfel & Turner, 1979), and perceive outgroup others incorrectly (e.g., Yudkin et al., 2019), connecting to unfamiliar others can be seen as a risky and cognitively demanding activity. Secondly, because people are more regularly on the move, connections are increasingly transient rather than stable.

People may be less willing or simply less able to invest the time and effort required to establish strong connections when others are not around for as long.

The HC opportunity presented by migration is that many people now have access to a range of diverse ideas and perspectives which is shown to be advantageous for some business functions such as improving individual creativity and innovation potential (e.g., Perry-Smith & Shalley, 2003; Pittaway et al., 2004). Together the HC challenges and opportunities related to migration present an interesting paradox. Being surrounded by diverse (i.e., unfamiliar) others can at the same time be perceived as offering both threats and opportunities.

Digitisation

Various technological changes are dramatically affecting HC-related behaviours and outcomes. There are few, if any, industries that do not rely partly or wholly on digital technologies (e.g., email, Yammer, Slack, WhatsApp, Zoom, MS Teams) for connectivity-related activities. As these technologies have all but replaced their analogue predecessors, people are communicating, and establishing and maintaining connections to others, in very different ways. An important HC-related challenge is the tendency of many such technologies to focus purely on the fulfilment of functional organisational objectives (e.g., speed up communication) while overlooking social objectives of the individual (e.g., relatedness) (Meske & Junglas, 2021). Although digitisation facilitates new distributed models of work (e.g., remote or hybrid work), research suggests that such models can hamper other collaborative business functions such as agreements and task coordination (e.g., Wohlers & Hertel, 2018).

Another challenge resides in the tendency of social media platforms used in professional contexts (e.g., LinkedIn, Twitter) to enhance homophilic outcomes through prioritising matching similar individuals rather than enhancing diversity. This effect, which has been shown to exist across a wide diversity of sociodemographic and behavioural dimensions (McPherson et al., 2001), can serve to widen ingroup/outgroup divides because similarities and differences become more obvious. Lacking exposure to and experience with dissimilar others, groups can

become polarised with individuals more suspicious and less trusting of people in other groups (Yudkin et al., 2019).

Digitisation also of course presents numerous opportunities to support HC in organisational contexts. This has been even more evident since early 2020 when the arrival of the COVID-19 pandemic forced millions of people to work remotely. Without the previously-mentioned digital technologies including a range of real-time, high-quality, video-calling services such as Zoom and Microsoft Teams, such a transition would have been almost impossible for many people. The digitisation of information and organisational processes also make it possible for colleagues to discover and connect with each other instantly and across large geographical and temporal distances. Other technologies, such as those that provide real-time transcription and translation, make it possible to connect in new ways with, for example hearing impaired colleagues and those from other cultures.

Optimisation

Most organisations are on a constant quest for performance optimisation, seeking to do things more efficiently to improve return on investment. While such a focus can improve an organisation's viability and financial sustainability, it can also affect HC outcomes. Optimisation, which prioritises utilisation, efficiency, and performance can undermine peoples' sense of community and connectedness (Sandstrom & Dunn, 2013). While such optimisation may be beneficial to the organisation in the short-term, over the long term it can result in general dissatisfaction among employees which can in turn accelerate attrition (Gretz & Jacobson, 2018).

One increasingly common example of optimisation affecting HC outcomes relates to an organisation rethinking their physical space requirements. Even prior to the arrival of the COVID-19 pandemic organisations were embracing flexible and asynchronous work patterns, changing office layouts and the way space is used (Wohlers & Hertel, 2018). When not all employees are in the physical premises at any one time, an organisation can significantly reduce the number of desks it must offer to its people, and hence the size of the office required to accommodate those desks. This of course can drastically reduce rent or real estate budgets. While such changes are often framed as offering employees flexibility and autonomy, many such decisions

are commercially driven and do not necessarily consider the effect such changes will have on HC experiences and outcomes (Bloom et al., 2015). For example, when not everyone is in the same geographic location, new HC-challenges arise including barriers to communication, brainstorming and problem-solving issues, and diminished knowledge sharing and socialisation (Choudhury, 2020).

The above examples highlight the importance of taking a holistic view of the potential unintended consequences of optimisation on HC outcomes. Optimisation can of course also support improving HC outcomes. The myriad of digital tools available to people in professional contexts can optimise the way people establish, maintain and leverage connections by making it easier to find relevant colleagues to connect with. This is particularly critical given the changing nature of work which necessitates maintaining larger and constantly changing networks of contacts. Optimisation, and the tools it brings, may help people to manage their growing professional networks (Nurmi & Hinds, 2020).

Decentralisation

A related change challenging HC outcomes in organisational contexts is the shift from hierarchical, rigid, and centralised organisational and team structures to flatter, fluid and decentralised ones (Tannenbaum et al., 2012). While a flatter, fluid and decentralised structure may afford a greater degree of flexibility, speed, and agility (Kleinman et al., 2020), its dynamic nature can negatively impact the HC process and outcomes in multiple ways.

In a rigid structure, it is arguably easier to identify and prioritise the other people within a team or the greater organisation with a whom a person should be connected. Colleagues are clearly mapped into distinct roles and there is an obvious line of command. As structures become more dynamic and people participate in multiple teams, it can become more difficult to identify the right person with whom to connect and to connect with them (Carboni et al., 2021). In addition to less rigid organisational structures making it more difficult to determine the relevant person to connect to, decentralisation can mean that other person is situated somewhere else geographically which eliminates the likelihood of bumping into them in the office (Khazanchi et al., 2018).

Decentralisation is also reflected in the way projects are managed with many organisations adopting more team-based work structures (Choudhury, 2020; Volini et al., 2019). Hadley and Mortensen (2021) highlight four features of modern team design that are having a marked impact on HC outcomes in the workplace. The first feature is the *fluid composition* of modern teams, referring to the way people fluidly join and depart teams as the project demands. The second feature is the *modularisation of roles,* whereby multiple people may possess the same discrete skill, making them interchangeable. Thirdly, for many people participation in a team is *part-time* so the same person may be a member of multiple teams simultaneously. And finally, modern teams are often created for a *short duration* and disbanded as soon as a project is delivered or the situation changes. Together, these four features mean that it can be difficult to know who is working in the same team at any one time, people may disappear from a team without really being noticed, and people have less time together overall. Given that proximity is one of the strongest predictors of connections forming between people (e.g., Allen, 2007; van Duijn et al., 2003) and that it takes time to build trust in teams (e.g., Jones & George, 1998), members of modern teams (i.e., colleagues) spending less time together can clearly be problematic.

Unfortunately, the benefits and opportunities arising from flatter, fluid and decentralised ways of working relate more to productivity and efficiency than they do to improved HC outcomes. One way the move to team-based work may help some people is that smaller teams can outperform large ones as people in smaller teams feel better supported by colleagues (e.g., Grant & Shandell, 2021).

In summary, HC is recognised as critically important in societal as well as organisational contexts. Although each context, and the myriad of sub-contexts into which each may be further segmented, is arguably different and is governed by a range of distinct social norms, the boundaries between contexts is often blurry. This suggests how understanding the HC objectives of people in one context may support understanding in other contexts. Peoples' HC objectives are generally aimed at addressing a range of connectivity-related challenges or leveraging connectivity-related opportunities. These challenges and opportunities are constantly changing,

impacted by factors such as migration, digitisation, optimisation, and decentralisation. Understanding the HC environment supports the nuanced contextual scoping of HC challenges. When HC challenges are better scoped, the requirements for a design to address them can better be specified, based on who is seeking to connect and what they are seeking to achieve through their connection.

2.3. Human connectivity knowledge base

The previous section describes the broad contexts in which HC occurs, the levels at which HC may be analysed, the challenges and opportunities that shape peoples' HC objectives, and the driving forces that continue to influence those challenges and opportunities. This section presents a review the knowledge base that supports our understanding of the HC process and outcomes. This understanding is essential for guiding design activities that are effective in addressing the challenges outlined in the previous section.

There exists much research across a range of disciplines, from psychology and sociology to neuroscience and management studies, that supports understanding of various aspects of HC. In addition to hundreds of books exploring aspects of this broad field of research and practice, several academic journals are dedicated to specific aspects of this vast and growing domain (e.g., *Human Relations*, *Journal of Social and Personal Relationships*, *Social Networks*, and *Social Forces*).

Different disciplines adopt different labels when referring to HC research. For example, within psychology, sociology, and organisation studies, such research is often referred to as *The Study of Interpersonal Relations*. Specific to psychology, the subject of *Relationship Science* has grown into a thriving sub-domain of psychological science in the past three decades (Reis et al., 2013). In sociology, sub-domains such as *social networks* and *social capital* emerged to explain groups of connections and the value people derive from their connections respectively. Organisational researchers have adopted and evolved ideas from their social science colleagues. Concepts such as *social networks* and *social capital* are also widely studied within organisational settings (e.g., Adler & Kwon, 2002; Inkpen & Tsang, 2005).

The fundamental importance of HC explains its relevance and subsequent prevalence in such a broad range of disciplines. The knowledge base supports

understanding of the importance of HC, the value people derive from their connections to each other, the process of connecting, and how HC outcomes might be measured. This provides a solid foundation in which design research and practice may be grounded as it helps to answer questions such as why people are driven to connect, how people experience the connectivity process, and what success looks like. These aspects of HC research are explored in the sections that follow.

2.3.1. The origins, importance, and outcomes of human connectivity

Humans have, it seems, always been driven to connect to each other. Explanations of connectivity-motivated behaviour in humans generally begin with evolutionary theories. For example, the social brain hypothesis (Dunbar, 1998) posits that it was the ability of early humans to form and operate in cohesive social groups, made possible due to a larger brain, that provided a competitive advantage over other species. Banding together afforded advantages that enhanced survival by improving access to resources (e.g., food) and defence capabilities (Van Vugt & Hart, 2004; Van Vugt & Park, 2009). This is supported by primate sociology research which similarly suggests that operating in groups offered access to resources (e.g., food) and reduced vulnerability to predation (Smelser & Baltes, 2001). The evolutionary perspective makes a compelling case for the advantages enjoyed by early humans due to their ability to successfully connect to others.

The need to be connected to others, commonly referred to a "need to belong", is considered a fundamental human need (Baumeister & Leary, 1995). Like other fundamental needs, this need manifests in a powerful motive, referred to as the *affiliation* motive (Aunger & Curtis, 2016; Kenrick et al., 2010) which drives much human behaviour. Other motivational theories offer similar explanations. For example, Self-Determination Theory (SDT) (R. M. Ryan & Deci, 2000) posits that *relatedness* is a universal psychological need that must be satisfied in order for a person to "enjoy high psychological well-being and psychological adjustment" (Lavigne et al., 2011, p. 1186). The strength of this need to belong is thought to vary from one person to the next (Leary et al., 2013).

Some authors frame this need to belong as manifesting in both positive and negative ways. In their Belongingness Orientation Model (BOM) Lavigne et al.,

(2011) make a distinction between a "growth orientation" and a "deficit-reduction orientation" of belonging. A growth orientation "leads one to connect with others while reflecting a genuine interest toward them" while a deficit-reduction orientation "leads to desire the closeness of others to fill a social void" (p.1186). These authors suggest that both orientations are present in all people to varying degrees as dictated by prior social experience. Similar explanations form the basis of exchange theory which, among other things, assumes that behaviour is motivated by the desire to increase gain and avoid loss (Cook, 2015)[2].

These days, most people generally do not face threat of predation so there is little need to band together to fight off predators[3]. In addition, the calories required for survival can, for many people, be obtained from the local corner store thus eliminating the need to join forces to hunt large prey. That said, "much of what we need and value (e.g., goods, services, and companionship) can only be obtained from others" (Molm, 2014, p. 199) and research into the behaviour of modern-day humans indicates that these evolutionary connectivity-focused survival mechanisms still exert powerful influence over how people think and act. For example the tendency of people to form snap judgements about the intentions and perceived relevance of others (Ambady et al., 2000) is explained evolutionarily as a survival mechanism that helped rapidly distinguish between friend and foe. To this day, this behaviour manifests in a tendency to rapidly categorise others as members of the *ingroup* (the group to which a person belongs) or the *outgroup*, whereby ingroup members are strongly favoured and outgroup others are ostracised (Tajfel et al., 1971). This has obvious implications for design activities that seek to connect people who may consider themselves to be different from each other as it implies a default tendency of people to seek out similar others and avoid dissimilar others.

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[2] In addition to seeking to increase gain and avoid loss, Exchange Theory also posits that: exchange relations develop in structures of mutual dependence; actors engage in recurrent, mutually contingent exchanges with specific partners over time; and valued outcomes obey the economic law of diminishing marginal utility (Cook, 2015, p. 485).

[3] As I complete this thesis, the war in Ukraine enters its fourth month. Although predation might be less common, I acknowledge there are of course other existential threats that cause people to band together for strength or protection.
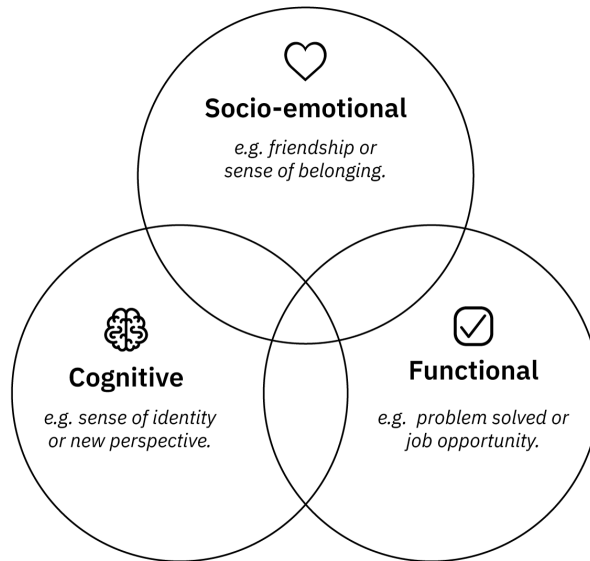
Figure 4: Three general types of benefit people derive from their connections to others

Whether directed toward growth (i.e., personal gain) or the avoidance of loss (i.e., deficit reduction), the benefits people derive from their connections to others can generally be categorised as socio-emotional, cognitive, and functional (Figure 4). *Socio-emotional benefits* refer to the positive feelings and emotions a person experiences through their social connections to others. As well as the positive feelings a person experiences through their connections (e.g., feeling part of a friendship group or family), a good sense of social connection to others is strongly linked to subjective well-being (Helliwell & Putnam, 2004; Seppala et al., 2013) which in turn can have a positive effect on a person's physical well-being and decrease their risk of mortality (Holt-Lunstad et al., 2015). *Cognitive benefits* refer to improvements in general cognitive abilities and/or broadening of a person's perspective through their connections to others. Common examples of cognitive benefits include supporting self-categorisation or strengthening of a person's self-identity (i.e., "Where do I fit in?") (Walton et al., 2012) and enabling a person to see the world differently (Vedantam & Freeman, 2018). Research has also shown links between feeling disconnected and negative cognitive outcomes. For example, simply anticipating aloneness has been shown to reduce cognitive processes (Baumeister, 2002). *Functional benefits* refer to those benefits a person receives from their connections to others that serve a clear functional purpose. Functional benefits manifest in a myriad

of forms including access to ideas (Burt, 2004), information and resources (Whittington et al., 2009), job opportunities (Uzzi, 2019), and more.

As visualised in Figure 4 and alluded to in the previous section, benefit types are not mutually exclusive. For example, if an intimate relationship forms between work colleagues from different departments or countries, they may derive all three types of benefit from each other. Functional benefits may be derived from the sharing of knowledge that supports problem solving or professional role fulfilment. Cognitive benefits may be derived from sharing their unique experiences. Socio-emotional benefits may be derived from their friendship. This further underlines the complex and nuanced nature of human connections, thus stressing the importance of better understanding HC in order to more accurately scope HC design activities for improved outcomes.

2.3.2. The experience of being connected vs of connecting

Although people are strongly motivated to connect by these functional, cognitive and/or socio-emotional benefits, many people do not enjoy the process of connecting, particularly in professional contexts (e.g., Casciaro et al., 2014; Gino, 2015). Interestingly, this is not limited to making new connections (i.e., connecting to strangers). Research also shows that some people even dislike the process of reconnecting to existing contacts (Walter et al., 2015).

There are three main explanations for people's lack of enjoyment of connecting to others. Firstly, many people feel anxious when connecting to others, or even when simply thinking about connecting. This anxiety is generally accepted to stem from a fear of rejection which is grounded in the fundamental need to belong discussed earlier (Lavigne et al., 2011). Because, evolutionarily speaking, survival often depended on being included in a group (Smelser & Baltes, 2001), rejection clearly had dire potential consequences. A second explanation, that relates to connecting for functional (sometimes referred to as 'instrumental') purposes, particularly in organisational settings, is that connecting to others can feel morally compromising (Casciaro et al., 2014). People can feel that they are acting inauthentically and "using" others. Finally, lack of enjoyment in connecting to others can stem from a lack of confidence in one's ability to connect (Kuwabara et al., 2020).

Connectivity ability relates not just to the possession of requisite skills but also to one's ability to make the right decisions during the connectivity process. In any social context, a person must decide whether a potential contact is worth pursuing or avoiding. However, depending on the circumstances, first impressions about other people and the value they could potentially represent "can be remarkably right or substantially wrong" (Carney et al., 2007, p. 1068). In line with evolutionary explanations, people are generally very good at making snap judgements regarding things that can be traced to the "life-saving and life promoting" survival mechanisms discussed earlier including "negative affect or threat, and intelligence or competence" (Carney et al., 2007, p. 1068). When it comes to less survival-critical attributes such as positive affect and social approach (i.e., extraversion and agreeableness), first impressions are generally less accurate (Carney et al., 2007). People also tend to drastically underestimate the likelihood that someone would respond positively to a request for help (Flynn & Lake, 2008). In other words, ability relates not just to the connectivity process itself but also to the ability to judge potential connectivity outcomes.

The challenges and inaccuracies many people experience when considering or participating in connectivity related behaviour can cause people to either avoid connecting altogether (Epley & Schroeder, 2014), or to limit connectivity activity to people like themselves (McPherson et al., 2001) or people they already know (Ingram & Morris, 2007). As such, extant literatures indicate that opportunities to make diverse connections, that can often be more useful or fruitful (e.g., for fostering creativity) (Haveman & Wetts, 2019), appear to be missed due to psychological and cognitive barriers that cause people to behave counterproductively. This alludes to sizeable individual and organisational advantages that may be realised by helping people to and through the HC process.

2.3.3. Factors affecting the human connectivity process and experience

The HC knowledge base highlights several factors known or assumed to influence the HC process and the experience of connecting. These are organised below as individual factors, social/group factors, and contextual factors. The next chapter (chapter 3) provides a more in-depth analysis of the HC process, deconstructing the process into distinct phases.

Individual factors

In addition to the factors introduced in the previous section that affect peoples' enjoyment of connecting and their ability to connect, the existing knowledge base suggests a range of factors, specific to individuals, that affect the HC process and subsequent outcomes. These include demographic factors (i.e., gender, social class, and race), personality, motives, and beliefs.

Demographic factors are known to affect HC outcomes in different ways. For example, strong gender-related differences have been shown to exist in organisational contexts where research suggests that women may be at a structural disadvantage when it comes to building networks (Forret & Dougherty, 2004; McGuire, 2002) because they simply don't have access to the most influential people in the organisation (typically white men in senior positions). Similar challenges have been recognised for non-white employees (McGuire, 2002). Others suggest gender-related differences may be explained by some women lacking the self-confidence to connect to such individuals (Greguletz et al., 2018). On the other hand, and related to the abilities discussed in the previous section, women have also been shown to be significantly more accurate than men at judging others across a range of dimensions (Carney et al., 2007). Therefore, it may just be that women's connectivity ability suffers due to their deliberate avoidance of those in power, who they are more adept at judging as threatening.

The effect of personality on HC outcomes has been well studied (for an overview relating to personality in organisational settings see Landis, 2016). It is generally accepted that extraverted individuals hold more central positions in social networks (e.g., Casciaro, 1998) meaning that they are typically better connected. The same is true for conscientious individuals, perhaps because highly dependable and

hardworking people may more likely be perceived as attractive friends and partners (Landis, 2016). Openness, another of the 'big 5' personality traits, also enhances the value of a person's network as it supports the broadening of network diversity (Landis, 2016).

As discussed earlier, the affiliation motive, aimed at satisfying the need for social capital and stemming from a fundamental need to belong (Aunger & Curtis, 2013; Lavigne et al., 2011), is seen as a survival mechanism which exerts powerful influence on the connectivity-related behaviour of most people. Other motives, that are seen to support the task of reproduction (i.e., lust, attract, love, and nurture) rather than belonging, also help explain why people are driven to connect to others. When we consider the other forms of value people derive from their connections to others (i.e., cognitive and functional value), the range of motives that help explain HC behaviour broadens to include those that meet the need for optimising social capital (i.e., hoard) and for optimising knowledge/skills (i.e., curiosity and play) (Aunger & Curtis, 2013). The presence of any or all of these motives can influence how much a person is willing to invest in connectivity-related activities. Equally, lacking motivation – because the anticipated rewards are unclear or don't appear to outweigh the cost or risk of connecting – may result in apathy or avoidance (e.g., Epley & Schroeder, 2014).

One additional individual-related factor that is known to affect the process of HC is people's beliefs, about themselves and about the HC process itself. Kuwabara et al., (2018) explain how people's beliefs regarding social intelligence (i.e., belief's about a person's general ability to connect to others), social relations (i.e., beliefs about the general nature of connections), and social capital (i.e., beliefs about the value that connections may provide), all affect HC outcomes. Those authors propose that, generally speaking and depending on the situation, people with malleable beliefs fare better when it comes to HC than those with fixed beliefs. This reflects the earlier notion that increased openness positively influences the HC process and outcomes (Landis, 2016).

Social/Group factors

When we shift our focus from the individual to the dyad or even more broadly to consider connections in the context of larger groups (e.g., teams, departments, or business units), the existing knowledge base highlights additional factors that can impact the HC process. These factors include: (inter)group structures and dynamics, shared experience and synchrony, trust, authenticity, vulnerability, perceptions of others, social norms and more.

Vast bodies of extant literature support our understanding of groups of connections, organised as communities or networks, and how different group structures can affect the value people derive from their connections to others. Two of the most important structural concepts relate to types of roles people assume within a network and are referred to as *bonding* and *bridging* (Burt, 1992; Granovetter, 1973). Bonding connections tie people closely together and are prevalent in networks where most people know each other. Close connections in dense networks create a sense of obligation and accountability between people. Bridging (sometimes referred to as "brokering") connections, on the other hand, are prevalent in networks where few people know each other and refer to connections that bridge or broker disparate networks. Bonding and bridging are recognised as complementing each other (Adler & Kwon, 2002). Together, they establish the requisite levels of trust (i.e., bonding) to improve knowledge transfer, while also ensuring connections to outside sources of knowledge and inspiration (i.e., bridging) which supports creativity and innovation (Haveman & Wetts, 2019).

Another factor acknowledged to accelerate the HC process and deepen the HC experience is a shared experience and/or a sense of synchrony (Seppala, 2012; Wiltermuth & Heath, 2009). The shared experience itself need not be positive. In fact, in situations of extreme stress, the connections formed between people can be incredibly strong. A good example of this is provided Barry Leonard, a passenger on the infamous flight 1549 that landed on the Hudson River in New York in 2009. Mr Leonard describes how the passengers on the flight, who prior to boarding were mostly strangers, now "refer to each other as a second family" (Leonard, 2019). This is explained by the knowledge that acute stress increases prosocial behaviour in humans (von Dawans et al., 2012). Fortunately, it is not necessary to survive a near

death experience for such deep connecting to occur. Strong social bonding is shown to be facilitated by group laughter (Vugt & Hardy, 2010) as well as group activities that involve coordinated physical movement such as walking in step or singing (Wiltermuth & Heath, 2009). Organisations are increasingly tapping into the power of synchronised activity such as group singing to improve mental health and social cohesion within the workplace (e.g., *ON:SONG Workplace Choirs and Online Singing*, 2021).

Trust between people is acknowledged to impact the HC process and experience. Dunn and Schweitzer (2005, p. 736) define trust as "the willingness to accept vulnerability based upon positive expectations about another's behaviour." Trust, in other words, involves a degree of risk that a person will behave as they're expected to behave. As HC generally includes an element of exchange or reciprocity (Molm, 2010), which does not always happen simultaneously or bi-directionally (i.e., the reciprocated value may come at a later time and from someone else in a network) (Baker, 2011), trust is important. The impact of trust, however, has been shown to vary based on the type of connection, the value being exchanged, and the stage in the connectivity process or lifecycle. Scholars distinguish between cognition-based (or competence-based) trust and affect-based (or benevolence-based) trust (Abrams et al., 2003; Chua et al., 2008). Cognition-based trust refers to judgements based on a person's competence and reliability (i.e., can and will a person do as they say they're going to do?). Affect-based trust is more related to emotions and feelings (i.e., does the person care about me and have my best interest at heart?). In some circumstances, particularly when connections are instrumental and functional value is sought, as is often the case in organisational contexts, cognition-based trust may be sufficient for a successful connection. When socio-emotional value is sought from another person however, affect-based trust is critical. The importance of these two forms of trust have been shown to vary throughout the lifecycle of a connection, with affect-based trust being most critical when a connection is initiated and cognition-based trust being important throughout (Dowell et al., 2015).

Vulnerability, mentioned above as being central to trust, is another factor that can affect the HC process. A strong proponent of the importance of vulnerability and its importance in facilitating HC, in professional and personal connections, is Brené

Brown. According to Brown, true belonging (and by extension, meaningful connections) requires people to be vulnerable and to show up in a true version of themselves – "to be who you are" (Schawbel, 2017). Unfortunately, due to the potential psychological risk involved in connecting to others, which is rooted in a fear of rejection, many people avoid vulnerability and instead take a more comfortable option that offers a degree of emotional protection yet reduces the depth of potential a connection may offer. This reflects one of the central notions of Social Penetration Theory (Altman & Taylor, 1973; Carpenter & Greene, 2015) that as connections develop, people share increasingly intimate information about themselves which in turn strengthens the bond between them. If people lack trust in the other and are therefore afraid of being vulnerable, connections will not advance to deeper and stronger levels.

The existing knowledge base tells us that the HC process and associated behaviour is guided by a range of powerful social norms, the most important of which is arguably the norm of *reciprocity* (Baker, 2011; Gouldner, 1960). Reciprocity – "the giving of benefits to another in return for benefits received" (Molm, 2010, p. 119) – is fundamental to the concept of exchange and thus to HC. As a norm, reciprocity is so fundamental to human cooperation that it generally does not involve formal agreements. Rather, it is based on implicit understanding. Baker (2011) distinguishes between five models of reciprocity (Figure 5), illustrating the various ways in which value may be reciprocated. Aside from direct reciprocity, in which the recipient (B) reciprocates to the originator (A) (i.e., value is returned to the originator from the person who received it), all other models illustrate how value may flow asynchronously and asymmetrically between groups of people. The originator (A) will likely receive value in return, but it may come from someone other than the person they provided value to in the first place (B). This highlights the importance of norms in influencing expected behaviour and how, for example in the case of diverse teams operating according by different norms, breakdowns may occur, thus undermining trust and the depth and strength of connections.
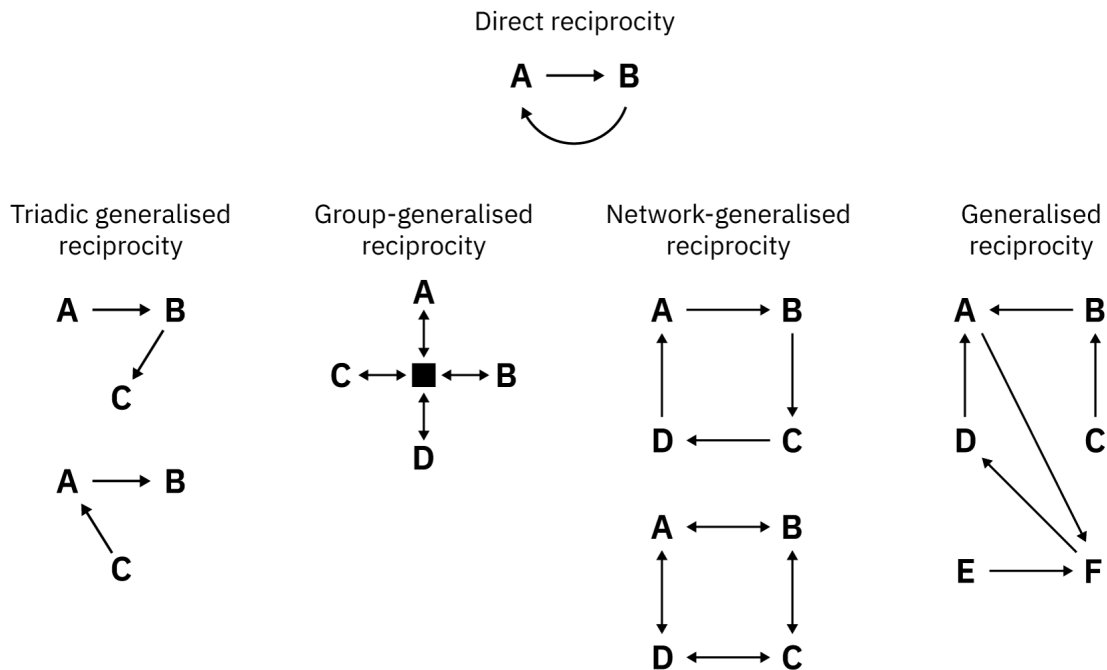
Figure 5. Types of reciprocity (from Baker, 2011. p.413)

Social perception (and subsequent categorisation) is the final social/group factor considered in this section as affecting the HC process. Humans are very quick to judge and subsequently to categorise others (Ambady et al., 2000). As discussed earlier, such judgements can be very accurate, but they are also often completely wrong. Two useful explanations for this tendency to judge others are that it serves as a survival mechanism and that it supports the conservation of cognitive resources. The survival-related explanation is that early humans had to quickly judge whether a stranger was friend or foe (Fiske et al., 2007) to determine if the stranger posed a potential threat to one's life. Although most humans no longer face such threats from each other, it seems that this evolutionary survival mechanism is still active and finely tuned. This is evident in the tendency of people to seek to determine whether a stranger is a member of a person's ingroup (i.e., related in some way) or an outgroup (Van Vugt & Park, 2009). Interestingly, the social cues that imply similarity can be subtle and incidental such as sharing the same date of birth (Walton et al., 2012) or appearing to appreciate the same abstract painting (Tajfel et al., 1971). This is important not just for the positive value people derive from their sense of connectedness to ingroup others but also because of the tendency to penalise

outgroup others (Tajfel & Turner, 1986). The conservation of resources explanation stems from research that suggests humans can only manage a limited number of connections at any one time (Dunbar, 2011). It is therefore in a person's best interest to judge the potential future value of a new contact because the time and other resources required to develop the connection will come at the expense of developing other connections (Hall & Davis, 2017).

Contextual factors

Just as with the two previous categories, the existing knowledge base highlights a range of contextual factors that are known to influence the HC process. Unlike the two previous categories, these factors are not directly related to people and can roughly be categorised as *environment* (i.e., relating to the built or digital environment in which connecting takes place), and *props* (i.e., non-permanent artefacts in a context).

Features of the environment in which connecting occurs play a critical role in helping and potentially hindering the HC process (e.g., Fayard & Weeks, 2007; M. Y. Lee et al., 2020; Wohlers & Hertel, 2018). Of all spatial factors, proximity is one of the strongest predictors of HC. People are more likely to connect with others they are proximate to (e.g., Allen, 2007; Kabo, 2016). Much research has shown the strong effect of physical proximity on the likes of friendship formation (van Duijn et al., 2003), knowledge flows (Inkpen & Tsang, 2005), and collaboration (Allen, 2007; Kabo et al., 2013), all facilitated through HC. These findings are supported by studies that show how the availability and use of shared amenities, thus enhancing proximity, also contribute to positive HC outcomes (e.g., Cabrera & Najarian, 2013). Other environmental factors that are known to affect the HC process include privacy (i.e., ability to control access to one's self) and crowding (i.e., excessive social stimulation) (Khazanchi et al., 2018) which both can influence people's willingness to share certain types of information. For example, research that studied the impact of an organisation's move from private to open-plan offices found that rather than stimulating connections, in open-plan offices there was a tendency to withdraw and interact over email instead of face-to-face (Bernstein & Turban, 2018).

Props, referring to non-permanent artefacts in a context, can also support the HC process. Two connectivity-supporting props most commonly referred to in the literature and anecdotally in practice are water-coolers and coffee makers (e.g., Miller, 2021; Waber et al., 2014). The theoretical explanation for the positive effect of these props, as well as others such as photo copiers, is that they legitimise congregation (Fayard & Weeks, 2007). That is, as well as their functional uses (i.e., providing water, coffee, and copies respectively), they generally require turn-taking, so people find themselves legitimately standing idle, often surrounded by others. In most circumstances, people will end up chatting, often to prevent the feelings of rejection and negative emotions produced by silence (Koudenburg et al., 2011). Another way that props can stimulate connectivity is by giving people something to talk about (Carmichael et al., 2015). When a prop is particularly novel, it can provide an entry point to a conversation. In some cases, the way a prop supports HC can be much more explicit. Examples include signs or other communications that grant permission to connect as well as instructing people how to do so in a particular context (Mandeno & Baxter, 2021).

The introduction of smartphones and other internet-connected digital devices are props that continue to have a transformational effect on the way most people connect. Although much research is still needed to fully understand their effects on HC outcomes, the general consensus is that such technologies provide a complementary rather than a supplementary role in supporting HC (Waytz & Gray, 2018). That is, digital technologies can maintain and strengthen connections already established offline, but connections experienced solely online do not provide the same level of benefits when no offline interaction is possible (Hallowell, 1999). Additionally, the mere presence of digital devices in offline contexts has been shown to be detrimental to HC outcomes, resulting in people being less trusting and empathetic toward each other (Przybylski & Weinstein, 2012), and generally less socially connected (Kushlev et al., 2017). So, while such technology-enabled connectivity has indeed granted people access to each other in new ways and made certain tasks more efficient, some argue that, paradoxically, the technologies that were supposed to bring us together have in fact made many people feel more alone (Turkle, 2017).

2.3.4. Human connectivity in design research

Human connectivity mostly features in extant design research literatures as a design input, and generally in the pursuit of other outcomes. For example, in Holtzblatt and Beyer's (2011) "Cool Project", *Connection* was revealed as one of four concepts said to make a product or user experience "Cool". Although these authors avoid providing an explicit definition of cool, they describe it generally as being "tightly connected to the experience of joy and delight" (Holtzblatt, 2011, p. 40). In other words, if a product or experience helps to foster relevant and meaningful connections, it is said to deliver joy and delight.

Human connectivity also features as a critical component of experience in positive design that links positivity (e.g., happiness) to the fulfilment of key psychological needs including relatedness (Hassenzahl et al., 2013). These authors do acknowledge the distinction between need and practice whereby the need for relatedness is universal but how this may manifest in practice is contextually driven and more nuanced. Relatedness, as a design input, provides both a starting point to provide focus in the design process and a means to evaluate success.

In design for social innovation, HC, framed as "strengthening human relationships", features as one of five systemic design principles (van der Bijl-Brouwer & Malcolm, 2020). This is explained by the way stronger human relationships enable learning and creativity, which in turn leads to more adaptable and resilient systems as a whole. These authors also acknowledge that service design, which has traditionally focused on designing scripts and blueprints, is well positioned to design for human relationships. The role of HC in systems design is reflected in other research into the requirements for the creation of resilient communities (Manzini & Thorpe, 2018). These authors make a strong case for how improving HC through art and design can help address the challenges created by a move from the intentional communities of the twentieth century to the "loose, flexible, temporary social networks" that characterise many communities of today (Manzini & Thorpe, 2018, p. 2).

Another example of HC featuring in design research is Cipolla's "Design for Vulnerability" (2018) work which formed part of the Resilient Communities project (Manzini & Thorpe, 2018). This research proposes vulnerability (known to facilitate HC – see previous section) as a positive aspect of design. Vulnerability was used as a

lens through which to evaluate a range of projects intended to bolster community resilience. Enablers of vulnerability were identified, and guidance was provided regarding how vulnerability could be used in design practice involving interpersonal encounters. This is one of the few studies encountered in this literature review that goes so far as to offer prescriptive advice aimed at improving HC outcomes as well as means of evaluating the HC potential of other designs.

What these examples have in common is their acknowledgement of the importance of human connections in improving other target outcomes of design including the perceived value of products and services, a person's sense of happiness, and the resilience of systems including communities.

2.3.5. Practical design expertise and artefacts

A review of the design literature also reveals many examples of design interventions intended to facilitate HC in playful, provocative ways. One such example is Kristina Niedderer's "Social Cups" (Niedderer, 2004, 2007). Social cups are an example of performative objects. These small stainless-steel cups are similar in form to a champagne flute but without a foot, so they will not stand up on their own. If participants in these studies wished to set their own cup down, they must find two other people to link their cup to. Social cups are designed to stimulate face-to-face interaction and make users more mindful of their interactions with others.

A collection of more than 50 equally provocative concepts (mostly functional prototypes or interactive exhibits) are presented by Mitchell et al., (2020). While not all are performative objects in the sense that they require users to perform certain functions for them to work, each example is intended to foster new social encounters. These examples, amusingly organised chronologically as "a day in the life", include: an alarm clock that calls a random number in your address book if you don't get up in time; a water pipe that only flows when two people grip it; smartphone controlled platform shoes that allow the wearer to adjust their height to look tall people in the eye; and a collection of park benches with moving seats, sloping seats, and lit up arrows, that encourage interpersonal proximity.

Another design research example of an artefact intended to enhance a user's sense of social connectedness is SnowGlobe – a lamp which creates interpersonal

awareness of people situated in remote living rooms. When a person moves, the lamp in the other person's living room glows. Users can also "nudge" each other. SnowGlobe is positioned under the umbrella of Social Awareness Systems (Visser et al., 2011). Social Awareness Systems "aim at increasing people's sense of social connectedness by providing them with peripheral awareness of information about people from their social network" (Visser et al., 2011, p. 129). The researchers concluded that this relatively simple intervention contributed positively to the saliency and perceived closeness of user's sense of connection to each other. These types of interventions are (increasingly) common in student design projects. Although there is some question as to how effective they are, they nonetheless provoke thought and explore the efficacy of different approaches to improving the HC experience and outcomes.

Considering the pervasive role digital technologies play in the everyday lives of most people, it is unsurprising to find examples of digital artefacts that take a technology-led approach to addressing HC challenges. These range from the well-known social media platforms such as LinkedIn, Facebook, and Twitter to experimental projects such as Friendlee (Ankolekar et al., 2009), a mobile app designed to reduce social clutter by making a person's closest contacts more prominent in their smartphone phonebook. The more embedded digital technologies become in people's everyday lives, the more research is being conducted to understand and explain their strengths and weaknesses. The more rigorous this understanding becomes, the better able it is to add rigour to design for HC activities.

Outside the formal boundaries of design research and practice there are also thousands of so-called experts in the field of HC, including the likes of community practitioners, event organisers, and expert networkers. These experts create opportunities to connect (e.g., networking events) and provide advice and practical support to people seeking to improve their ability to connect. For example, in her book "The Art of Gathering", Priya Parker (2018) proposes what she refers to as a human-centred approach to gathering people together to facilitate connectivity. This highlights the role of the host in designing events tailored to the needs of guests. A different approach is offered by Dr Christian Busch (2020) who provides advice for people and organisations seeking to develop what he refers to as "Serendipity

Mindset", improving the likelihood that valuable chance-connections are identified and established by design. And then there are hundreds of books, blogs, and YouTube videos in which experts provide guidance regarding how to build communities (e.g., Richardson et al., 2019) or be better at networking (e.g., Zack, 2019).

2.3.6. Measuring human connectivity outcomes

One more way the existing knowledge base can support DfHC activities is in the provision of measurement instruments that enable the accurate evaluation of HC outcomes. The measurement of HC outcomes is critical in both the *design cycle* (i.e., evaluating the efficacy of a design against prescribed criteria) and in the *requirements cycle* (i.e., evaluating the efficacy of a design in the field) of Figure 3. This section highlights existing instruments that are commonly used to measure aspects of HC outcomes. Questions of connection quantity, quality, and strength are also addressed.

Measurement Instruments

A review of the literature reveals a small collection of well-tested instruments that measure aspects of HC outcomes in certain contexts, although most are solely concerned with measuring the closeness of interpersonal (i.e., romantic or friendship) relationships. Examples include frameworks and instrument such as the measurement of romantic love (Rubin, 1970), the Relationship Closeness Inventory (RCI) (Berscheid et al., 1989), the Social Connectedness and Social Assurance Scales (R. M. Lee & Robbins, 1995), the Inclusion of Other in the Self (IOS) Scale (Aron et al., 1992) and the Psychological Sense of Community (PSOC) (Boyd & Nowell, 2013). A related category of instruments focuses on the measurement of deficiencies in HC where "loneliness" rather than "connectedness" is of most interest (for a review see Shaver & Brennan, 1991). The instrument most widely cited in the literature for the measurement of loneliness is the UCLA Loneliness Scale (Russell, 1996; Russell et al., 1980).

The measurement of a person's sense of connectedness (or loneliness) relies on self-reporting which, as acknowledged by most authors, can challenge the reliability of such instruments. Most measures make use of statements or questions through which participants indicate the extent to which they are in agreement with a statement or the frequency with which they experience the feeling described in the

question. For example, the UCLA Loneliness Scale includes positively framed questions such as "How often do you "feel" that you are in tune with the people around you?" and negatively framed questions such as "How often do you feel that no one really knows you well?" (Russell, 1996, p. 23). One outlier in the field of instruments using self-report scales to measure a person's sense of connectedness is the IOS Scale (Aron et al., 1992). Rather than being question-based, this instrument instead takes a simple visual approach to indicate the degree of closeness a person feels for another (see Figure 6). As indicated, participants are simply asked to indicate which of the seven instances of two overlapping rings best represents their relationship. A notable distinction between the IOS scale and most belongingness or loneliness scales is that the IOS scale focuses on a person's sense of connectedness to a target other rather that a person's general sense of connectedness overall.

Please circle the picture below which best describes your relationship
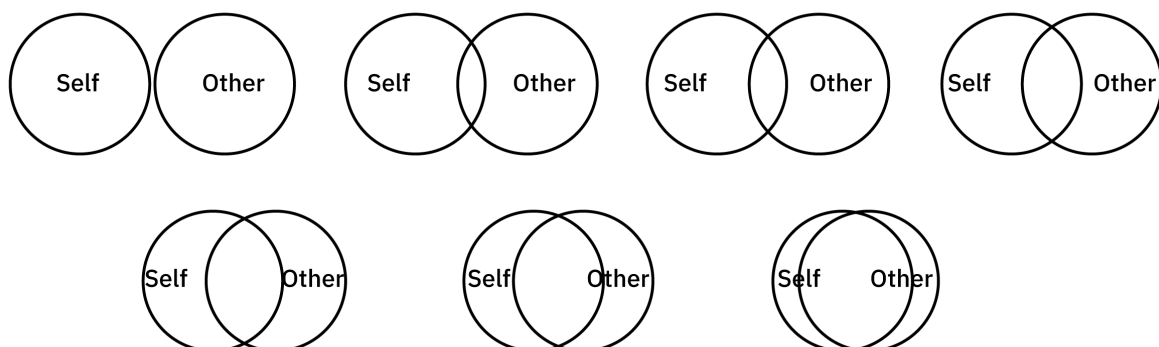
Figure 6: Inclusion of the Other in the Self (IOS) Scale (Aron et al., 1992. p. 597)

Daniel van Bel and colleagues (van Bel et al., 2009) provide, to my knowledge, the only attempt at creating an instrument that recognises a person's sense of belonging at both the *individual level* (i.e., measuring a person's sense of social connectedness to a named individual) and what they term the *overall level* (i.e., "people in my social network"). These authors note the importance of the temporal nature of such measurements as a person's sense of social connectedness may change from moment to moment.

Aside from the empirical limitation of most measures, due to their reliance on self-report data, another important limitation is that they focus on a limited range of

outcomes. Loneliness is undoubtedly a challenge for many people, societies and organisations, having even been referred to as an epidemic by some (Luna & Holt-Lunstad, 2019; Murthy, 2017). However, knowing that people are more or less lonely, in love, or socially connected, does not capture the full extent of the value people derive from their connections to others. Human connections are unique and inherently complex, which has led to, in the words of Kelley et al., (1983), "a tendency to treat the dyad as a "black box", with much theorising about its contents but little effort to determine them" (p.66).

The outcomes of instrumental connections (i.e., functional value) are arguably easier to measure as such outcomes are easier to quantify. For example, if the value sought through a connection is a new job or the solution to a problem, one can simply ask if a particular connection led to a person securing a new job or solving the problem at hand. Conversely, measuring connectivity where the value derived is primarily socio-emotional and/or cognitive is far more challenging due to the subjective nature of the outcomes. In addition, as described earlier in this chapter, the types of value people derive from their connections to others are seldom distinct. While an organisation may primarily be interested in knowledge transfer (functional value), team members may perceive the friendships (socio-emotional value) they derive from colleagues to be more important.

Connection Quantity, Quality, and Strength

Three other ways the value of HC is seemingly measured and articulated in the existing knowledge base relate to the optimum *quantity* of connections, the *quality* of connections, and connection *strength*.

Quantity of connections refers to the total number of connections a person has, needs, or can feasibly maintain. Accurately measuring a person's total number of connections is challenging as it can be difficult to keep track of absolutely everyone with whom someone is connected. Although the widespread use of digital technologies such as smart-phones (with address books) and social media has arguably made it easier to track a person's contacts, what these numbers mean is open to debate. For example, data from LinkedIn suggests that the average number of connections per person on their platform is 930 while the average number of

connections of "regular users" is 400, compared to 338 on Facebook (Petrov, 2021). This of course begs the question: what constitutes a connection? As some scholars point out, having more connections on such platforms does not correlate with feeling better connected (e.g., Turkle, 2017). Studies that examine the number of "close connections" people report as having paint a very different picture. For example, data from the United States, where the majority of LinkedIn members are located, suggest that more than a quarter of people have no one to confide in at work (McPherson et al., 2006). Reiterating a point made earlier, while digital technologies may make it easier to amass and manage connections, perhaps they do not add real HC value to a person's professional life. Outside these measures of how many connections a person has or needs, another relevant quantitative measure is the number of connections a person can realistically maintain. It is proposed that this number, commonly referred to as "Dunbar's Number" is approximately 150 (Dunbar, 2011; Hill & Dunbar, 2003). Interestingly, research suggests that earlier in life (e.g., in a person's 20s) people are more interested in the *quantity* of connections they have whereas later in life (e.g., in their 40s) connection *quality* becomes more important (Carmichael et al., 2015).

The *quality* of connections, commonly referred to in the literature as "relationship quality", has been studied extensively in contexts ranging from marriage to marketing to management (Aron et al., 2000; Athanasopoulou, 2009; Semrau & Werner, 2014; Stephens et al., 2012). The depth and breadth of research around this topic suggests that improving the quality of connections is a worthwhile objective. Doing so requires a clear definition of quality and a means of measuring it. As the previous section indicated however, clearly defining and measuring HC is inherently difficult. Connection quality varies from context to context and person to person. In their research of HC in organisational settings, Stephens et al., (2012) use the term High Quality Connections (HQCs) to refer to "short-term, dyadic, positive interactions" where positivity is in reference to "the subjective experience of the connected individuals and the structural features of the connection" (p. 385). Experience is defined in terms of the vitality a person feels from the connection, the sense of positive regard they feel from others, and the degree of mutuality in the connection. The structural features that support this definition include the emotional carrying capacity of the connection; its tensility, or ability to withstand strain; and the

connection's connectivity which defines its openness to new ideas and influences (Stephens et al., 2012). Again, while such a definition provides additional nuance to our understanding of different types of connections, it also adds more questions. For example, how should emotional carrying capacity, tensility, and openness be accurately understood and measured in a generalisable way?

The final point to cover in this section on connectivity measurement relates to connection *strength*. Since Granovetter's seminal (1973) article "The Strength of Weak ties", hundreds of articles have explored or made reference to this idea of connection strength and how the strength of a connection supports our understanding of its function. Strong ties are synonymous with close and intimate connections such as family, friends, and close colleagues. A person's strong ties will generally know each other. Weak ties, on the other hand, are synonymous with acquaintances. These are typically contacts who a person knows well enough to engage and exchange with but who are more likely to sit at the periphery of a person's network. As such, these contacts will also be members of other networks. The key advantage of weak over strong ties is that weak ties are better sources of non-redundant information (Perry-Smith, 2006).

Together, this collection of measures, instruments, and perspectives offers a broad range of possible ways to consider the quantity, quality, and general state of connections between people in all manner of contexts. I acknowledge that this introduction to the measurement of connections barely scratches the surface of this topic. Providing a complete exploration is well beyond the scope of this work. However, albeit brief, this overview highlights both the importance of connection quality and the challenges involved in accurately defining and measuring it.

2.3.7. Section summary: What we know about HC

As this chapter has thus far shown, being connected to others is a fundamental human need. Connections to others facilitate a range of benefits and when lacking can result in disastrous consequences. Despite the fundamental importance of connecting to others, many people fail to satisfy their HC objectives or requirements. Extant literatures support our understanding of factors that may influence the HC process, both positively and negatively. A review of design research literatures reveals

several examples of HC being recognised as an important input of design although this is not always explicit and such work often focuses on the pursuit of other (non-human-connectivity) objectives. Next to a broad and deep empirical knowledge base, much can be learned from expert practitioners as well as from practical design research and design artefacts that are shown to improve HC outcomes. And finally, the knowledge base contains a range of approaches and instruments that facilitate the measurement of various types of HC outcomes although such instruments tend to be limited in their focus and overly rely on self-report measures. Highlights from this chapter are summarised in Table 4 below.

Table 4: What we know about human connectivity

Topic	What we know
Contextualising and situating HC	• Human connections are broadly contextualised as personal (i.e., relating to private life) and professional (i.e., relating to work life), although the boundary between personal and professional contexts is becoming increasingly blurred. • Within any context, there are countless situations in which connecting is attempted and/or occurs. Each situation can be unique in terms of its requirements. • Analysing HC generally occurs at the level of the *dyad*, *group*, or *population*. Historically, the most frequently studied dyad is the romantic partnership. Commonly used constructs in the analysis of groups of connections include *communities* and *networks*.
Human connectivity challenges	• Human connectivity challenges are often complex and multi-faceted. Addressing them requires a holistic, contextually sensitive approach. • Changes to the design of organisational systems, the way work is done, and from where it is done, are negatively affecting the HC process and outcomes in organisations. • A range of geographical, political, technological, social, and economic trends are introducing new HC challenges and opportunities. Such trends are also influencing many people's HC needs and the ability of people to satisfy those needs.

Motives and the value of connecting	• Feeling connected to others, often referred to as a need for belonging, is a fundamental human need which people are strongly motivated to satisfy.
	• Humans' ability to connect, and thus form large social groups, is thought to have provided an evolutionary advantage.
	• Connections to others are critical for the health, happiness, and prosperity of all people. By extension, organisations benefit greatly when their people feel suitably connected.
	• There is strong evidence of links between HC and key performance indicators in organisations (e.g., level of creativity and innovation capability).
	• People are motivated to connect to others for personal gain or the avoidance of loss. Potential losses or gains (i.e., the value derived through one's connections) can be categorised as functional, cognitive, or socio-emotional.
	• Organisations are increasingly recognising the importance of the socio-emotional and cognitive value people derive from their workplace connections (i.e., in addition to functional value).
	• Most human connections involve a degree of reciprocity, although this need not be symmetric, and the reciprocated value need not be equal in kind.
	• Types of value are not mutually exclusive, thus contributing to the challenge of fully understanding HC and predicting connectivity-related behaviour.
	• Motivation to connect can differ between contexts, from situation to situation, and throughout a person's career and/or life.
Barriers, enablers, and the HC process	• Demographic factors can influence HC outcomes. In some organisational contexts, women, minorities, and people of lower social classes find it more difficult to meet their HC objectives.
	• A person's personality can affect their ability to connect, their experience of connecting, and the position they hold in a network. Extraversion, conscientiousness, and openness lead to better HC outcomes.

- A person's beliefs about themselves and the HC process can affect their ability to connect. People with more malleable beliefs fare better than those with fixed mindsets.

- The structure of groups/networks and peoples' positions within them (e.g., bonding, bridging, and brokering) influences the HC process and the type of value exchanged between people.

- Trust, particularly as it facilitates vulnerability, plays a critical role in HC. Different types of value exchange require different types and levels of trust.

- A shared experience or sense of synchrony generally facilitates the HC process and resulting strength of connections.

- People make snap judgements about others which affect the likelihood of a connection and the form it may take. Others in a person's ingroup are treated favourably over outgroup others.

- Human connectivity deficiencies are generally attributed to individuals (i.e., focus on need to improve ability) rather than contexts (i.e., optimising conditions for connectivity), although many contextual factors exert powerful influence on HC outcomes.

- Proximity is one of the strongest predictors of HC.

- Privacy affects people's willingness to share certain types of information and thus affects formation of deep connections.

- Certain props provide strong permission granting effects (e.g., stimulating conversation, normalising congregation, legitimising idle behaviour).

- Digital technologies can both support and undermine people's ability to satisfy their HC needs.

Measuring HC	- Most instruments for measuring HC are narrow in their focus on the socio-emotional experience of personal relationships (e.g., sense of love, closeness, belonging, or social isolation). - Existing instruments are designed to measure a person's sense of connectedness in general (i.e., to any/all people) or to a specific person and tend to take a snapshot view of connections rather than seeing HC as a process.

	- Existing instruments assume a singular overall connectivity objective rather than an evolving range of objectives that change depending on the context and stage in the process. - Connections are often described in terms of their quantity, quality, and strength although the specificity and usefulness of such measures is variable and sometimes questionable.
The experience of connecting	- While most people understand the importance of connecting to others, they often avoid connecting altogether or seek out others they already know due to discomfort with the process. - Many people consider themselves to be poor connectors and thus dislike the experience of connecting to others. - Different people experience HC in different ways. Different contexts appear to favour different people (e.g., senior white males fare better in traditional organisational contexts). - The HC process is generally considered in holistic terms with a focus on what is happening rather than what people are doing or seeking to achieve.

Despite the breadth, depth and richness of the existing knowledge base, its fragmented nature and differences across disciplines makes it less useful for supporting DfHC. Organising and structuring this knowledge consistently and in a way more suited to design would support designers and practitioners both in grounding their work in existing knowledge and in adding rigour to their activities such that the outcomes of design might make valuable knowledge contributions. In the next section, an approach to the structured formalisation of DfHC is suggested, grounded in the knowledge base and meeting the requirements of the environment.

2.4. Design for human connectivity

Returning to the framework introduced at the start of this chapter (repeated here for convenience as Figure 7), DfHC is situated between the HC environment (reviewed in section 2.2) and the HC knowledge base (reviewed in section 2.3). The review of the literature thus far (summarised above in Table 4) highlights the importance of HC and the complexity, evolving nature, and apparent increase of HC challenges. Although much is known about why people are motivated to connect, the benefits

people derive from their connections to others, and how some aspects of connectedness may be measured, existing knowledge is mostly not framed in a way suited to supporting design activities. A review of relevant design research literatures (see section 2.3.4 and summary in Table 5 below) highlights that while HC does feature as an input to design and as a desired outcome of some design activities, DfHC currently lacks definition, structure, and rigour. In addition, there appears to be little consideration for how the pursuit of other design objectives (e.g., optimisation) can inadvertently have a negative impact on HC outcomes.

In this section, critical gaps are addressed through the development of the middle box in Figure 7 (i.e., Design for Human Connectivity) and through more deeply exploring its relationship to the environment and the knowledge base by way of the relevance and rigour cycles. An agenda for further research is proposed followed by a summary of the parts of the agenda addressed in this thesis.
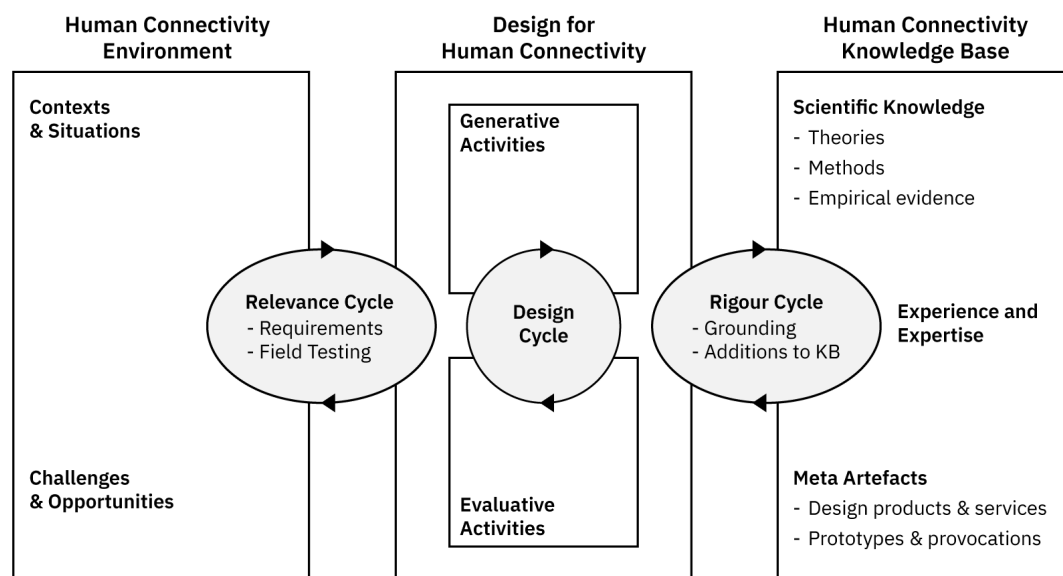
Figure 7: A 3-cycle framework for Design for Human Connectivity

Table 5: Key insights from review of HC in design (research)

Human connectivity in design	• Human connectivity is recognised as an important input to design.
	• Improving HC outcomes is increasingly a desired objective of design activities.
	• Designers and practitioners often rely on personal experience and anecdotal evidence to guide the design of solutions to address HC challenges.
	• The evaluation of design activities aimed at addressing HC challenges is often neglected, anecdotal, or incomplete.
	• The pursuit of other design objectives (e.g., optimisation) can inadvertently undermine HC outcomes.
	• Design for human connectivity as a distinct field currently lacks definition, structure, and rigour.
	• Design can play a critical role the practical application of the knowledge base to address HC challenges.

The core of DfHC is the systematic process of utilising HC knowledge to address HC challenges. This process consists of three key cycles (Figure 7). The design cycle is the interplay of generative and evaluative activities which together create design activity. The design cycle is linked to the environment and knowledge base through the relevance cycle and rigour cycle, respectively. The relevance cycle ensures that generative and evaluative activities relate to the environment in appropriate ways. Likewise, the rigour cycle ensures that design activities are both grounded in and contribute to the scientific, experiential, and artefact-based knowledge of HC. Together, these boxes represent a general relationship within DfHC and provide a structure for a design research agenda. Key areas to explore within this framework are summarised in Table 6 below and elaborated upon thereafter. The questions presented in Table 6 are meant to broaden and position DfHC research through the lens of the three cycles. This is not intended to be an exhaustive list by any means. The hope is that this list of questions will invite additional thought into DfHC as a more formal area of research and practice.

Table 6: Design for human connectivity research agenda

Cycle	Research Questions
Design cycle	• What kinds of activities are currently performed to support generative and evaluative DfHC practices? How effective are these? • How do design activities change when dealing with different types of HC challenges? What activities are generalisable across contexts or challenge areas? • How do designers work with other stakeholders when designing HC interventions? • How can designers leverage the latent knowledge of connectivity experts (e.g., professional networkers and community builders) in the DfHC process? • What existing yet undocumented methods currently support the design of effective HC solutions? • What existing tools and methods, currently not used, might support HC design activities and how would these change fundamental learning? What new tools might be created to provide more targeted support? • How can insights from HC-related design activities be captured to support learning? • How are HC-related design outcomes currently evaluated?
Relevance cycle	• How is DfHC contextualised? In what contexts does most DfHC activity occur? Are some contexts over- or under-supported? • What HC situations attract the most attention from designers and practitioners and how well are these situations understood? How generalisable are insights and mechanisms across situations? • What does the prevalence and acceptance of new innovations in the field (e.g., by users, organisations, and the media) tell us about emerging trends and the need for HC design solutions? • How are HC challenges understood and framed? How useful is this framing in supporting the generation and evaluation of relevant solutions? How might this be improved? What existing frameworks can support the categorisation of HC challenges? • How can designers leverage insights from relevant industry experts (e.g., strategists, economists, organisational designers) to better understand and articulate HC challenges? • How effective is the current vocabulary in supporting the articulation of HC needs in critical contexts and situations? How might this be improved?

- How does understanding of the HC environment support the generation of DfHC design briefs? What are the inputs to these briefs and how useful are these inputs? What existing design methods can support the generation of stronger DfHC briefs?

- How are the requirements of a design specified? How may requirements be categorised and generalised across contexts, situations, and challenges?

- How effectively do designers work with HC domain experts? How could such collaborations (better) be supported?

- What routes to connectivity exist and how are these embodied in design interventions?

- How does the evaluation of design iterations in the design cycle improve an intervention's impact in the environment?

Rigour cycle	• How can the knowledge base support understanding of HC challenges (e.g., why people fail to meet their HC objectives and how needs are changing)?
	• What does the knowledge base tell us about the HC process and experience? What are the component parts of this process? How do a person's needs and objectives change throughout the process?
	• What theories and frameworks are designers currently using to ground HC activities? How effective are these? What is missing?
	• How can theories and frameworks be operationalised for DfHC activities?
	• How are DfHC outputs contributing to the knowledge base? In which fields of research? How are such contributions accepted?
	• How can the knowledge base guide the improvement of rigour in DfHC activities?
	• What learnings from existing DfHC activities can make valuable contributions to the knowledge base?
	• How can HC practitioners be empowered to more successfully generate, evaluate, and document design artefacts?
	• What frameworks and instruments in the knowledge base can support the measurement of HC outcomes? How useful are these frameworks and instruments? In what areas are they deficient?
	• What generalisable mechanisms explain the success of existing interventions?

2.4.1. The design cycle

Much work needs to be done to understand and support key design activities within a DfHC context. At a basic level, the type of generative and evaluative HC activities conducted and their efficacy and accessibility within design all need to be explored. This may help designers to better understand the approaches to DfHC that are most useful in generating effective solutions, and how solutions generated within the design cycle can best be evaluated. To achieve this, DfHC must be recognised as a distinct field of design research and practice rather than HC simply being an input to other design activities or a consequential outcome of the pursuit of other design objectives.

Encouragingly, there exists a broad and deep base of relevant knowledge and design practice that may be adopted to support the growth of DfHC. Currently, this support is ill-structured and often seen as tangential to core DfHC activities. In addition, a rigorous analysis of successful HC design interventions to capture relevant insights will support continued learning in DfHC. This contrasts with the current situation where learnings are often isolated, context specific, and limited to observed HC outcomes rather than the design process that produced them. More can be done to try to generalise learning across various HC contexts to improve the way DfHC is done. And finally, more bespoke research is needed to develop specific DfHC tools and methods to enable the structured and effective application of existing knowledge to HC challenges.

2.4.2. The relevance cycle

Key considerations within the relevance cycle include scoping design challenges, the identification of requirements for the design, and evaluation or testing of a design to determine its effectiveness in the real world. Importantly, these considerations can take place at any point within the design process. For instance, evaluative work may be conducted to understand a context or to evaluate the effectiveness of an existing solution in the field, and generative work may be conducted to develop a set of requirements for a new solution or general principles to guide design activities.

As noted earlier, HC challenges are often framed broadly and holistically which, unsurprisingly, leads to generic solutions that fail to acknowledge the

specificity of the context, the situation, and the particular challenge. Resulting interventions are non-specific, success metrics against which interventions are evaluated are inadequate or inappropriate, and organisations often lack the vocabulary to approach problems in the first place. More research is needed into the types of HC challenges that exist, the contexts and situations in which these challenges manifest, and the human-centric experience of HC in these contexts and situations. Together, this will support the more accurate framing of HC challenges and the generation of design briefs that are useful in guiding targeted DfHC activities. Research should consider how HC challenges can be contextualised, whether some contexts are over- or under-supported, and what factors may be generalised across contexts. Further research is needed to establish how DfHC briefs can best be generated and communicated. In addition, structured research into the way HC solutions are implemented and evaluated in the field will help improve subsequent activities and may ultimately support the generation of new knowledge.

2.4.3. The rigour cycle

The current general lack of rigour in DfHC activities has three important negative consequences. Firstly, not making consistent, structured, and effective use of the knowledge base is likely leading to design solutions that fail to fully address the nuance and complexity of HC and that are generally less effective in addressing relevant HC challenges. Secondly, when design activities fail to adequately draw on the knowledge base, the effect of design solutions can be isolated to a specific context and less able to scale reliably. And thirdly, not grounded in existing knowledge and not derived through methodical means, new insights can lack rigour and are therefore less likely or able to contribute to the knowledge base.

Research is required to better understand and organise extant theories and knowledge in a way better suited to supporting design. In addition, insights from practice need to be suitably organised to usefully inform and support DfHC activities. Further work is required to determine what knowledge is currently most useful, how it is useful in supporting design activities, and what, if any, gaps exist in the knowledge base that need to be filled. Likewise, research is required to support designers in going further than simply recognising the importance of this knowledge

at an abstract level (e.g., how *relatedness* is currently recognised in design). Additional work is needed to operationalise this knowledge for application in DfHC activities. And finally, research that helps explain how currently successful solutions lead to desired outcomes can support the development of new frameworks that guide future, more rigorous work that itself is more likely to make important contributions to the knowledge base.

2.5. The focus of this work

The overall aim of this PhD project, as stated in the introduction, is *to formalise and grow DfHC as a distinct field of design research and practice, generating new knowledge that guides the creation of a design support, to support both generative and evaluative HC design activities*. Articulated as such, the key outcome is therefore the formalisation of DfHC, and the key output is a design support. It is anticipated that in the pursuit of this key output, additional outputs will be generated and significant steps will be taken toward achieving the target outcome. As the previous sections have shown, human connectivity is a vast field of research and practice. Even narrowing the focus of this work to *dyadic connections in contemporary work situations* still leaves a sizeable amount of ground to cover which is well beyond the scope of a single PhD. With this in mind, the attention of this work will focus on foundational areas of DfHC that are likely to address critical gaps in the literature and practice, and that will provide the best foundation for the creation of the design support.

A logical starting point is to improve understanding of the HC process as experienced by individuals connecting or seeking to connect. Achieving this will require deconstructing what is currently commonly seen as a singular activity (i.e., establishing a connection) into a series of individual activities that may be scrutinised and understood independently. Once the HC process is deconstructed into a series of discrete phases, each characterised by a distinct activity and set of requirements, focus will shift to a deeper understanding of the factors that help or hinder a person as they move through the HC process in contemporary work situations. While this chapter has shown that much can be learned from existing literatures and practical examples, additional research will be required to identify undocumented gaps.

Synthesis will be required to organise existing and new knowledge in a way that better supports design.

Together these activities will begin to address a number of general questions and requirements introduced in Table 6. For example, the introduction of a consistent vocabulary can support collaborative design activities by aiding designers and practitioners in better articulating HC challenges and opportunities. In addition, insights derived in the completion of this research and the creation of the design support should not only support the design of new interventions but should also support understanding of why some existing interventions are more or less effective.

2.6. Discussion

The importance of HC in organisational contexts, coupled with the growth and complexity of related challenges that mean many people are failing to satisfy their HC objectives, suggests a tremendous opportunity for design-led activities to improve HC outcomes. Achieving this, however, may be supported and accelerated by addressing the current lack of specific attention HC receives in design research and practice. While the body of knowledge that supports understanding of HC continues to grow, in design research and practice HC is currently not generally recognised as a distinct activity. Rather, aspects of the need for connectedness (e.g., relatedness) are included as inputs to the pursuit of other design outcomes and improving HC outcomes is often an accidental by-product of other design activities. Where HC is the intended purpose of design, the HC design cycle currently lacks structure. As a result, designers and practitioners are not always able to adequately articulate HC challenges or objectives, nor can they make full use of the knowledge and expertise available to them. Addressing these deficiencies may be supported through the structured formalisation of DfHC as a distinct discipline within design research and practice.

As noted previously, the most important gaps to be addressed in growing DfHC are clarifying design challenges and supporting the design process. With clearly articulated challenges, designers can be more targeted in their efforts and confident of their ability to intervene in a context, to create solutions that successfully integrate in relevant application environments. More effectively drawing on the knowledge

base, designers can add rigour to their activities, inspired by and building on existing knowledge, experience, and artefacts.

A review of the literature and conversations with designers and practitioners highlights that much DfHC activity occurs without clear nor grounded direction. Designers and practitioners are often creating products, services, experiences, systems and more without a clearly articulated HC-related design brief. One of the reasons for this stems from the current difficulty of articulating target HC outcomes to any degree of specificity. While ambitions such as "getting everyone on the same page" or "breaking down silos" make for good rallying cries, when pressed, designers and practitioners can struggle to specify exactly what they mean and for whom. Lacking clearly specified target outcomes makes the focus of design unclear. Lacking target outcomes also makes it difficult to isolate the contextual factors that are most likely to influence HC outcomes, that these may be tactically addressed through the design solution. Not having a quality design brief limits the designer's or practitioner's ability, both to create an effective design solution and to evaluate the solution's effectiveness.

The current lack of scoping of HC challenges in organisations often leads to the default selection of generic solutions such as "happy-hours" and "networking events" that are organised on a regular basis, institutionalised and with little deliberation regarding the specific purpose they serve (Coburn, 2016). Scoping helps to narrow the focus of a design solution such that an articulable problem or opportunity is recognised (van Aken, 2007), and criteria for the design solution are specified (Sanders & Stappers, 2008). This can be especially challenging, but is vitally important, within organisations which are considered to be complex social systems (van Aken, 2007) and where the term "problem mess" is used to describe some challenges, referring to "a mess of issues, of opinions and value judgments on those issues, of interests, power and influence" (van Aken et al., 2007, p. 9). This messiness in scoping challenges is most problematic in the early stages or so-called "fuzzy front end" of design (Sanders & Stappers, 2008). More research is required to understand the specific contexts and situations in which HC occurs and where improved outcomes are sought, thus serving to "de-fuzz" this process. Identifying and articulating the nuanced differences and similarities between contexts will support

understanding of generalisable mechanisms that consistently influence HC challenges. Insights from industry experts (e.g., strategists and economists) can help explain the trends that lead to changes in connectivity needs. To be useful in supporting scoping activities, however, such insights should be organised and interpreted in a way that supports DfHC. Finally, adopting a contextual lens in measuring the effectiveness of solutions in the field can improve the scoping of HC challenges and, as this contextual understanding grows, can suggest generalisable aspects of solutions that may have positive impact in related contexts.

If scoping helps to answer the question of *where* a solution is required (i.e., the context and situation) and *why* it is required (i.e., the specific challenge the solution is addressing), the requirements within the relevance cycle helps focus on *what* is required. Here too, more research is needed. Not only will this help in articulating the specific requirements of a design solution, but it will also help define the criteria for evaluation of that solution. Currently, this granular level of understanding seems to be mostly overlooked, with designers and practitioners relying rather on assumptions and intuition to guide the requirements of generative HC design activities. Similarly, the evaluation of those activities is often either neglected or purely anecdotal (e.g., "people said they had a great time and all the food was gone"). Research is needed to determine how HC requirements are currently derived and articulated to support the creation of design briefs or in generally informing design. The critical analysis of these requirements will help to identify those that best contribute to desired HC outcomes as well as any potential gaps where important requirements are overlooked. Better articulation and categorisation of requirements will aid the creation of methods and tools that support the evaluation of solutions against pre-determined criteria. And finally, taking a structured and rigorous approach to the study of the application of solutions in the field will support designers in reducing the required number of design iterations and may generate insights that make valuable contributions to the knowledge base.

Designers also lack structured guidance regarding the individual, social, and contextual factors that influence HC outcomes. Such guidance is essential for both generative and evaluative design activities. When the intended objective of a design activity does not relate specifically to HC, designers lack the support required to

foresee what, if any, unintended HC outcomes might be. It seems that HC is currently not prioritised as a consideration in the early stages of design in the same way that other higher-level considerations (e.g., sustainability) are. Together, these gaps indicate specific areas in which structure may be added to support the design for HC design cycle.

Encouragingly, the existing knowledge base is rich with insights that aid understanding of people's motivations to connect, the value people derive from their connections to others, and factors that can help or hinder the connectivity process. This knowledge is, however, not organised in a useful way to support design research and practice. Just as important, the fundamental importance of HC is often not considered in design activities, inadvertently leading to detrimental outcomes. Were requisite knowledge to be structured in a way that better supported design activities and prioritised earlier in the design process, the HC outcomes from design activities would surely improve.

2.7. Conclusion

The opportunities afforded by the systematic and structured formalisation of DfHC as a distinct field of design research and practice appear substantial. As HC challenges continue to grow and become increasingly complex due to a range of seismic changes in the way people live and work, design can play a critical role in addressing these challenges to deliver improved HC outcomes. Achieving this, however, requires elevating the importance of HC in design. It requires leveraging design (research) methods to add nuance and specificity to the scoping of HC challenges, that they are more deeply and accurately understood, framed, and briefed. It requires synthesising and structuring the extensive and solid foundation of existing knowledge, practical experience, and examples, that it may better be applied to specific HC challenges. And it requires developing DfHC as a distinct field of design research and practice specialised in both generative and evaluative HC design activities.

Positioning and growing DfHC between the ever-changing HC environment and the HC knowledge base helps to ensure relevant HC challenges are sufficiently understood and accurately framed and that existing knowledge is usefully structured and rigorously applied. This PhD project assumes the ambitious task of laying the

initial foundation for DfHC as well as suggesting potential directions for future work. As the world seemingly becomes increasingly disconnected, it is time for design to play a more active and structured role in addressing this multi-faceted global challenge.

3. The Connector's Journey

"People meet and separate. But funny things happen in between."

(Knapp, 1978, p. 3)

3.1. The human connectivity process

While it is the *outcomes* of HC that motivate people to connect to others, these outcomes can only be attained when a person successfully navigates the HC *process*. The HC process refers to the sequence of actions undertaken by a protagonist (which we refer to as the *Connector*) in connecting to someone else (the *Contact*) in order to derive sought outcomes. The HC process can begin before people are even aware of each other and ends when people no longer feel a sense of connection to each other (Knapp, 1978; Levinger, 1980).

The HC process can be thought of as analogous to a user journey, a tool common in human-centred design (Giacomin, 2014). Central to the HC process is a sequence of activities a person does in seeking to meet phase-level objectives and ultimately some overall HC objective(s). Identifying and articulating the activities a person seeks to complete in order to meet their objectives throughout the HC process helps to highlight activity-level requirements, thus helping designers and practitioners to focus their efforts.

Considering the broad range of benefits (i.e., HC outcomes) people derive from their connections to others and the often life-changing importance of those benefits (e.g., Holt-Lunstad et al., 2015; Uzzi & Dunlap, 2005), supporting the HC process through design is clearly a valuable endeavour. Improving the HC process should lead to improved outcomes, or at least improve the likelihood that desired outcomes are eventually attained.

An analysis of relevant HC literatures (see previous chapter) reveals a disproportionate amount of attention focused on identifying, describing, and understanding the "why" and "what" of HC (i.e., motivation to connect and outcomes of being connected), while the "how" (i.e., the process of connecting) is notably less well understood. As a result, many designers and practitioners rely on intuition, possibly informed by observation and personal experience, when scoping HC

challenges and designing for improved HC outcomes. Lacking a nuanced understanding of the HC process, designers and practitioners tend to set broad, all-encompassing HC objectives (e.g., "break down silos") rather than focusing their efforts on objectives that target a specific type of stakeholder seeking a specific objective in a specific phase of the process. An accurate and nuanced understanding of the HC process will support generative design activities that better support people through the HC process thus improving outcomes. This additional depth of understanding of the process will also aid evaluative design activities, helping to identify deficiencies in a design according to where in the process they exist.

Improving the designer's and practitioner's understanding of the HC process requires firstly reframing the process as a journey through which a person proceeds and secondly deconstructing the process into its component phases. Reframing can be supported by adopting a human-centred design perspective through which one can more effectively interrogate the needs and objectives of target individuals moving through a process (Giacomin, 2014). Deconstruction of the HC process into its component phases will help identify the key activity, the specific objective(s), the requirement(s), and the start and end points of each phase that the process comprises. Understanding the HC process with this added nuance will facilitate scoping HC challenges at the phase-level and generating designs that support people throughout the journey as their needs and the context change. While much can be learned from existing HC process models and frameworks, a closer analysis reveals that these are mostly not generalisable (i.e., applicable in various contexts), nor suited to supporting design. This is because existing frameworks tend to be specific to a particular context (e.g., personal romantic relationships or professional mentor relationships) and framed from the researcher's perspective rather than from the perspective of those seeking to connect. Their subsequent structure and language are therefore specific just to the context for which they are created. This chapter presents *The Connector's Journey*, a new HC process framework better suited to providing this support.

3.2. Method

The development of the new HC process framework presented in this chapter – *the Connector's Journey* - was achieved through a snowballing literature review (Wohlin, 2014) in combination with a process of abductive synthesis and reasoning, a common element of design synthesis and inference (Cramer-Petersen et al., 2019).

A snowballing literature review was deemed best suited here due to the breadth of research areas in which relevant HC-related research can be found (Wohlin, 2014) and the equal breadth of terms used to describe the frameworks and their component phases or stages. An initial search using Google Scholar, Scopus, and EBSCO revealed a limited set of relevant frameworks from psychology, sociology and management sources. Multiple iterations of backward and forward snowballing followed until no further sources could be found.

The synthesis process was inspired by Kolko's (2010) "action-framework of synthesis" (p. 21) where abduction and sensemaking are achieved through the actions of prioritising, judging and forging connections. Although not normally or necessarily followed linearly, these roughly sequential steps are useful in guiding the synthesis process.

Prioritising involved the collection of data through the literature review and by drawing on insights from conversations with experts and experience from more than a decade of practice. Literature was sought that would provide a representative sample of existing frameworks describing the HC process across multiple contexts. Eight existing HC process frameworks were selected for analysis and prioritisation. Judging involved a process of synthesis or, as Kolko (2010) describes it, passing the data "through a sieve" (p. 22) to determine what is most relevant in the given context. This judging occurred at a framework level as well as a phase level. That is, here it was determined not only which frameworks were most relevant for analysis but also which phase(s) within those frameworks best reflected the connectivity journey observed in practice. Forging connections between phases was the final abductive action and involved understanding and articulating the relationships between prioritised phases to connect them in a new HC process framework – the Connector's Journey.

Our analysis of existing frameworks highlighted deficiencies that made them less suited to supporting design. Usefully, this analysis also allowed us to specify the attributes of a new framework that would be required to fulfil this purpose. Guided by these attributes and adopting a Connector-centred perspective, a new framework is proposed that addresses the deficiencies identified in existing frameworks and is deemed more suited to supporting design. A subsequent comparison with existing frameworks indicates similarities and differences.

The next sections describe each of the three "acts" in more detail. Section 3.3 describes the selection and *prioritisation* of existing frameworks. Section 3.4 explains how existing frameworks and individual phases were *judged* and describes in more detail the Connector-centred lens adopted for the development of a new framework (see 3.4.4). Section 3.5 describes how connections were *forged* resulting in the new framework. The component phases of the new framework are, thereafter, explored and described in detail.

3.3. Prioritising: a short-list of existing frameworks

The literature review revealed 17 frameworks that deconstruct the HC process across a range of contexts. Nine frameworks from this initial set were eliminated because, although they provided useful insights, their unit of analysis is the organisation (i.e., business-to-business relationships) or broader groups (i.e., network relationships). Eight frameworks remained for comparison and analysis (Table 7). All eight are examples of frameworks that deconstruct the HC process for interpersonal dyadic connections. Of these frameworks, two (i.e., Kram, 1983; Porter & Woo, 2015) are specific to interpersonal connections in professional contexts while the remainder are concerned with connections in personal contexts (e.g., friendships and romantic relationships). The frameworks range in number of phases from three (i.e., Gillath et al., 2016; Porter & Woo, 2015; Terveen & McDonald, 2005) to ten (i.e., Knapp, 1978). Of the eight frameworks analysed, five refer to their component steps as "stages" and three refer to "phases" reflecting a subtle distinction between existing frameworks in terms of their structure and intended purpose. Following Table 7 (in the next section), the differences between the frameworks are discussed, with reference to contextual differences, their framing, and their structure.

Table 7: A selection of frameworks deconstructing the process of human connectivity

Authors and context (S)tages, (P)hases	Phase labels and descriptions
(Altman & Taylor, 1973) (S) Primarily concerned with romantic relationships from a social penetration perspective.	1. Orientation – surface level interaction in which people evaluate each other cautiously and tentatively. 2. Exploratory Affective Exchange – people open up slightly and become more synchronised with limited commitments. 3. Affective Exchange – people are comfortable with each other and more ready to evaluate one another. Interaction is spontaneous and free. 4. Stable Exchange – deep understanding of each other and richer communication.
(Knapp, 1978) (S) Interpersonal relationships of all kinds.	1. Initiation – first impressions are made and a person decides whether to pursue the other person. 2. Experimentation – casual exploration of the other. 3. Intensifying – exchange between the two individuals deepens to a point of mutual affection. 4. Integration – the relationship is maintained, and social identities are shared. 'I' becomes 'we'. 5. Bonding – making the relationship public and exclusive. 6. Differentiating – the first stage of decoupling in which differences are recognized. 7. Circumscribing – characterized by a noticeable reduction in exchange between the individuals. 8. Stagnation – the individuals feel stuck in a rut and there is practically no exchange between them. 9. Avoidance – partners typically move to separate environments. 10. Terminance – the partnership ends.
(Levinger, 1980) (P) Interpersonal (romantic) relationships.	1. Attraction – the early stage of the relationship. 2. Building – the relationship develops. 3. Continuation – the relationship continues to grow or hits a point of "congenial but bland coexistence". 4. Decline – the relationship deteriorates. 5. Ending – the relationship is terminated.

(Kram, 1983) (P) Mentor/mentee relationships in organizations.	1. Initiation - the relationship starts. 2. Cultivation – boundaries of the relationship are defined and a full range of functions are explored. 3. Separation – structural and psychological separation as the mentee progresses to the next stage in their career. 4. Redefinition – the relationship evolves to become less formal, akin to friendship, where the individuals generally achieve peer status.
(DeVito, 1991) (S) Interpersonal relationships of all kinds.	1. Contact – including initial awareness, interaction, and assessment of the other. 2. Involvement – in which more frequent mutual interactions are accompanied by pleasant feelings. 3. Intimacy – signified by personal and interpersonal commitment, social bonding, and potentially social anxiety. 4. Deterioration – in which damage is done to the relationship and bonds between individuals weaken. 5. Repair – in which attempts are made to repair the damage and re-strengthen the bonds. 6. Dissolution – in which the relationship ends.
(Terveen & McDonald, 2005) (P) Stages of online (e.g., dating) relationship development.	1. Match – where two individuals are paired based on an 'explicit request or implicit opportunity' (p.404). 2. Introduce – where the matched individuals are introduced. 3. Interact – where the matched individuals have some kind of exchange.
(Porter & Woo, 2015) (S) Stages of professional relationship development.	1. Initiation – where network partners engage with and evaluate each other. 2. Growth – where behaviours are performed with the intention of strengthening the relationship. 3. Maintenance – where networking interactions continue.
(Gillath et al., 2016) (S) Attachment theory perspective of romantic relationships.	1. Formation – includes the time from initial contact to the point that a relationship is established. 2. Maintenance – focuses on keeping a relationship intact. 3. Dissolution – when a relationship is terminated.

3.4. Judging: Suitability of existing frameworks and phases

Existing frameworks were analysed according to three key criteria to determine their generalisability and usefulness to design - namely:

- **Context**: For what context is the framework created and how generalisable is the framework to other contexts?
- **Framing**: What (or whose) perspective is taken in the framing of the framework?
- **Structure**: What are the component phases of the framework and how does this structure reflect the experience and activities of the Connector as they proceed through the phases?

3.4.1. Context

Existing frameworks consider the HC process in a range of contexts which can generally be categorised as either personal or professional. Of the frameworks that consider personal contexts, early research (i.e., prior to 1980) tends to focus on the analysis of intimate personal relationships (e.g., romantic heterosexual relationships) with the work of Altman and Taylor (1973) and Knapp (1978) providing a solid foundation for the more than four decades of research that has followed. Contextualising their work, Altman and Taylor (1973) describe their interest in "the growth and deterioration of social bonds from strangership to marriage or to other close ties" (p. v). The framework presented by Levinger (1980) is proposed as applying to all manner of "close relationships" where closeness is synonymous with interdependence. Levinger (1980) makes an explicit distinction between short-term and long-term interactions where his framework describes the HC process of the latter, specifically focusing on the process experienced by couples (i.e., marital relationships) over time. It should be noted that most early academic work found reflects the experience of American (i.e., Western) couples.

In organisational literatures that consider the HC process in professional contexts the unit of analysis is often the organisation (e.g., inter-organisational connections) or the network (i.e., groups within or between organisations). Less attention is paid to the HC process in dyadic interpersonal connections in organisations. There are some exceptions, as highlighted by the two examples in

Table 7 (i.e., Kram, 1983; Porter & Woo, 2015). Each of these examples addresses a specific situation within the context of the organisation, namely mentor/mentee relationships (Kram, 1983) and the professional network development of individuals (Porter & Woo, 2015) respectively.

3.4.2. Framing

The way the HC process, or research that explores the process, is framed has important implications for design. Framing helps to "clarify both the ends to be achieved and the possible means of achieving them" (Schön, 1994, p. 41). In the case of HC, framing helps us to understand the context in which connecting is happening and the person or people who influence and are affected by outcomes. An examination of existing frameworks reveals them, for the most part, to be framed: from the researcher's perspective; through a limited number of theoretical lenses; and, by the type of connection or where connecting is occurring. This is reflected in the framework-level and phase-level terminology of existing frameworks.

The language adopted by existing frameworks implies an outside-in (i.e., researcher-centric) perspective rather than an inside-out (i.e., human-centred or user-centred) perspective. The labels applied to the different phases of these frameworks tend to describe the general state of the relationship in terms of what is happening (e.g., "initiation", "formation", "continuation", "cultivation", "growth") (e.g., Gillath et al., 2016; Kram, 1983; Levinger, 1980; Porter & Woo, 2015) or how the relationship is changing (e.g., "intensifying", "differentiating", "ending") (e.g., Knapp, 1978; Levinger, 1980). This descriptive language suggests a focus on understanding and explaining what is going on throughout the lifecycle of a relationship, rather than specifying the objectives of people as they navigate the process.

Different theoretical lenses also serve to frame existing HC research. The work of Knapp (1978) and DeVito (1991) for example, considers HC and the development of relationships according to the communicative processes at play. Framed as research in *Interpersonal Communication*, this work focuses specifically on the communicative behaviour (both verbal and non-verbal) of people as they proceed through the lifespan of a relationship. With their introduction of *Social Penetration Theory*, Altman and Taylor (1973) consider not just how people communicate but,

perhaps more importantly, also the types of things that are communicated. A central premise of social penetration theory is that as people disclose more about themselves, relationships become more intimate (Carpenter & Greene, 2015). Levinger (1980) adopts a *Social Psychological* perspective in constructing his model of interpersonal relatedness. Central to this work are the concepts of relatedness and interdependence.

As highlighted in the previous section, additional specificity to the way research is framed is provided by categorising the type of connection being formed (e.g., mentor/mentee relationships) (Kram, 1983), or where connecting is occurring (e.g., online relationships) (Terveen & McDonald, 2005).

The way prior research is framed helps to explain the terminological differences between existing frameworks. This is evident in the names of the frameworks, the way they are described, and in the specific labels given to a framework's component phases. Regarding the titles and descriptions of the frameworks themselves, Knapp (1978) refers to "the stages of human interaction", whereas Levinger (1980) refers to "a model of close relationships" and Devito (1991) introduces "a five-stage model of interpersonal relationships". Taking examples from organisational contexts, Porter and Woo (2015) refer to a "dynamic, psychological model of strategic networking" and Kram (1983) refers to her model as "phases of the mentor relationship". Each contextualised framework involves differences in explicit or implicit outcomes for both the process (e.g., develop an online relationship) and phase (e.g., the pairing of two individuals during the match stage).

Related to these between-framework terminological differences, which make existing frameworks less suited to supporting design, within-framework inconsistencies are also evident. Some terms applied to phases appear to refer to the connecting or connected individuals while others refer to the connection itself. Taking the framework of Knapp (1978) to illustrate, labels applied to some phases (e.g., initiation, integration, bonding) suggest what people might be doing in those phases and thus what the objective or end state of the phase might be. For example, the apparent objective of the first phase is to initiate the connection and therefore the behaviour of interest is initiating a connection. We can assume that this phase is complete once the connection is initiated. Other labels (e.g., experimentation,

differentiating), however, also describe what is happening or what people are doing but an end state of the phase is less obvious. For example, in the experimentation phase, people are experimenting, but it is difficult to draw a line to conclude that people have successfully experimented. Yet other phases (e.g., stagnation and terminance) seem to refer more to the relationship itself than the individuals or what they are doing. We are more likely to say that a relationship has stagnated than we are to say that a person has stagnated their efforts. Similar patterns are observed in other existing frameworks. While these frameworks' approach to labelling does provide a general idea of what is occurring at each phase, it does not necessarily provide designers with the requisite understanding of the specific activity or objectives of each phase.

3.4.3. Structure

With few exceptions, existing frameworks generally proceed through the three broadly accepted phases of relationship development: a *beginning phase,* in which the relationship is initiated and develops; a *middle phase,* in which the relationship continues along a variety of possible trajectories; and, an *end phase*, in which the relationship deteriorates and potentially terminates (van Duijn et al., 2003). Despite this common general progression, there are notable differences in the number of phases, the start and end points, and phase typologies in existing frameworks (see Table 7). In addition, existing frameworks differ in their interpretation of the progression of people through the phases.

The first, and most obvious difference between the existing frameworks is the number of phases they comprise. This is often a reflection of the start and end points of each framework (e.g., starting later or ending earlier in the process) or their degree of specificity. The number of phases that existing frameworks comprise ranges from three (Gillath et al., 2016; Porter & Woo, 2015; Terveen & McDonald, 2005) to ten (Knapp, 1978). The start point of most frameworks implies a moment that people are attracted to (Levinger, 1980), matched with (Terveen & McDonald, 2005), or make contact with (DeVito, 1991) each other. Other frameworks use the more general terms of "initiation" (Knapp, 1978; Kram, 1983; Porter & Woo, 2015),

"orientation" (Altman & Taylor, 1973), or "formation" (Gillath et al., 2016) to indicate their first phase.

The limited number of phases included in some frameworks can be contextually explained by a framework's focus on just a part of the process. This is generally reflected in a framework's end point. For example, Terveen and McDonald's (2005) three phase framework only considers the HC process up to the point that people "interact". Similarly, looking specifically at the context of professional network development, Porter and Woo's (2015) framework only extends to the point of "maintenance". The exception to this rule is Gillath et al.'s (2016) framework which also comprises just three phases but which ends with dissolution. The two four-phase frameworks included in our selection also only focus on part of the connectivity process. Altman and Taylor's (1973) framework charts the progression of a relationship to a point of "stable exchange" and Kram's (1983) framework of mentor relationships concludes with a phase of "redefinition". Existing frameworks of five or more phases all proceed through to the dissolution or termination of the connection.

Although the structure of all existing frameworks implies a relatively linear chronological progression through the phases, most recognise the broad variation in trajectories in the progression and regression that connections take. Two contrasting illustrations of these differences are provided by Knapp (1978) (Figure 8) and Levinger (1980) (Figure 9). Knapp (1978) uses the analogy of a staircase to illustrate a relationship's progression (ascending the left side of the staircase) and regression (descending the right side of the staircase). A relationship can stabilise at any point (hence the middle 'stabilizing' column of steps) and needs not proceed to the top step (bonding) before regressing.
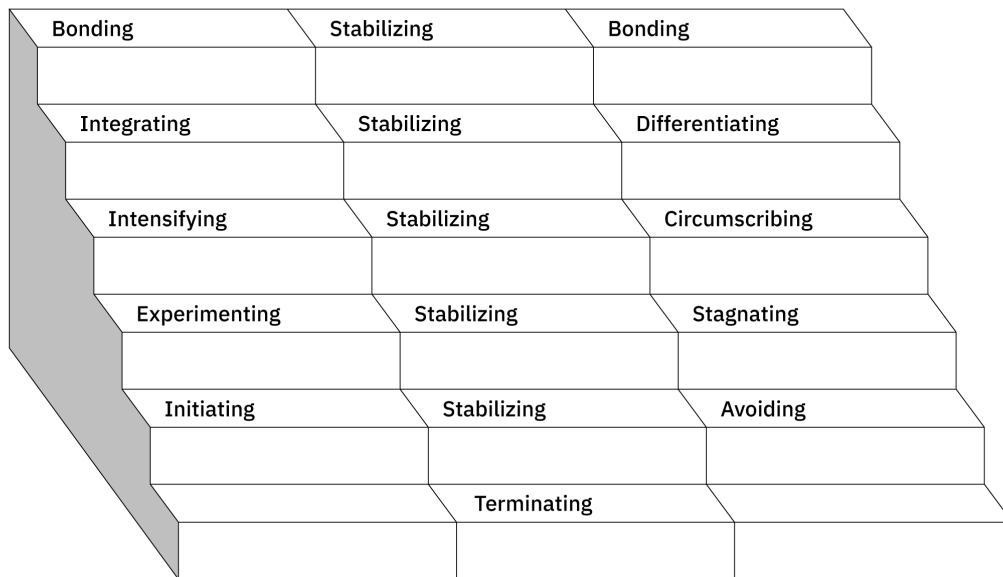
Figure 8: Knapp's "staircase model of interaction phases" (Knapp, 1978, p. 33)

Levinger's (1980) model suggests more of a linear progression through the phases from attraction to ending and the trajectory of a relationship will follow one of three general paths (see Figure 9). In this model, all relationships traverse the first two phases (i.e., "attraction" and "building") in much the same way. It is the third phase (i.e., "continuation") where differences are noted. In the most positive case (i.e., "satisfying continuation"), a relationship will continue to grow over time until ending due to natural causes (i.e., death). In the neutral case (i.e., "static continuation"), the relationship will remain much the same although people will become slightly less involved over time. In the worst case (i.e., "conflictual continuation"), the relationship will experience turbulence and will be generally unstable over time. In both latter cases, relationships reach a point at which they deteriorate and eventually end through separation. It is important to note that although both models refer to social relationships, that of Levinger is solely concerned with marital (i.e., "couple") relationships, which is reflected in the model's terminology.
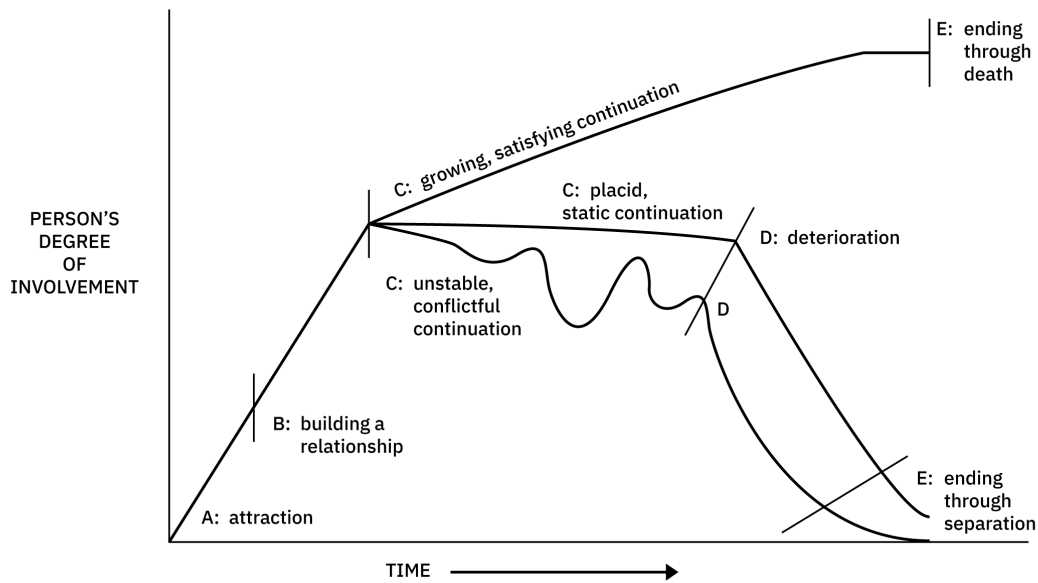
Figure 9: Levinger's "Longitudinal course of a partner's involvement in three contrasting couple relationships" (Levinger, 1980, p. 522)

In summary, the differences between existing frameworks in terms of their context (e.g. various personal and professional contexts of varying degrees of specificity), framing (e.g., researcher-perspective, theoretical lens and target audience), and structure (e.g., inconsistencies in number of phases, start and end points, and phase typologies) make these frameworks less generalisable and less suited to supporting design. Not only can it be difficult for designers and practitioners to locate and select a framework, the ambiguity regarding a person's specific activity and objectives in each phase makes it difficult to determine where to focus design efforts and what a successful outcome may be. That said, existing frameworks do provide invaluable input for the development of a new framework better suited to design. Inspiration for structuring a new framework from the Connector's persective may be drawn from examples of user-journeys or customer-journeys that "make the process slightly more manageable" (Lemon & Verhoef, 2016, p. 76) and that "represent what actually happens from the [user's] point of view" (Zomerdijk & Voss, 2010, p. 74). In developing a framework to guide the HC design process, inspiration may also be drawn from models commonly used in design such as the Double Diamond (Design Council, 2007) in which the design process is separated into its component parts and specific tools can support a person in each stage of this process.

3.4.4. A shift in perspective: from researcher-centred to human-centred

Of the three key deficiencies of existing frameworks for supporting design, it is their researcher-centredness which is important to consider more deeply. Although existing frameworks aid our understanding of connections and deconstruct the general process of connecting, they tend to suggest what is happening to the connection rather than communicating the activities and objectives of the connecting dyad. That is, they describe what is happening rather than what people are doing or seeking to do. Without a clear understanding of what people are seeking to achieve, it is difficult to support them through design. Taking a human-centred (i.e., Connector-centred) perspective to understand the experience of the Connector as they move through the different phases of a connection will help to derive their objectives, not only of the entire process but of each individual phase.

Human-centred design places people at "the center of the story" (T. Brown & Katz, 2009, p. 39). What distinguishes human-centred design from other, more traditional design practices is that "the natural focus of the questions, insights and activities lies with the people for whom the product, system or service is intended, rather than in the designer's personal creative process or within the material and technological substrates of the artefact." (Giacomin, 2014, p. 610). Reinterpreting this distinction for the HC process and related research, we would say that the natural focus of the questions, insights and activities should lie with the Connector, and to some degree the Contact, rather than with the researcher or practitioner. It is about focusing on how to support the person or people who are connecting.

This shift from a researcher-centred to a human-centred approach means that rather than merely describing the state of a connection or how a connection is changing, a new framework for the HC process should consider: the specific objectives of people as they move through the process; the activities required to meet those objectives; and the specific requirements to successfully complete those activities. Abstracting the HC process in this way, by focusing on the common activity-related objectives and requirements of the Connector and the Contact, has the benefit of decontextualising the process which will help to reveal commonalities across multiple contexts. Thus, decontextualisation helps to create a more generalisable framework comprising phases that are common to more situations. Examples of this

type of description are common within design. For instance, describing the journey of a designer or design team as they move through different phases (see Dubberly, 2008 for a comprehensive list of such examples) helps to manage and support design activity. As is the case with the examples noted, a deeper understanding of each unique phase makes it possible to consider how a person might be supported, through design, in completing critical activities to fulfil their connectivity objectives. It also becomes possible to isolate the most important phases of the process and understand each phase's relationship to the others.

The *customer journey* (sometimes referred to in design as the *user journey*) is a tool commonly used in human-centred design (Giacomin, 2014) to understand the behaviours, feelings, motives and attitudes of people as they navigate all key touchpoints of a customer experience. Capturing and visually communicating this journey, as a series of key phases in which critical customer-centric attributes are highlighted, is generally referred to as customer journey mapping. Adopting this approach to map the HC process usefully shifts the perspective from the researcher or practitioner to the Connector (and Contact) and should help meet the objective of identifying not just the critical phases of the process but also the objectives, activities, and requirements of the Connector (and Contact). Considering the HC process as a journey also makes more explicit the links between the phases. For example, how might the way in which a connection is initiated impact the development and outcomes of the connection. Interestingly, Levinger's (1980) (Figure 9) is the only existing framework visualised in a way somewhat resembling a user-journey.

3.5. Forging connections: development of a new framework

Synthesis and sensemaking involved an iterative process of comparing and contrasting the phase-level structure of existing frameworks with each other and with observations and experience from the field. Existing frameworks were deconstructed, and phase labels reinterpreted to enable the grouping of common phases (e.g., "cultivation", "building", and "growth" are relatively synonymous in indicating that a connection is forming or developing). This process revealed a long-list of framework-independent phases (i.e., what Kolko (2010) refers to as "existing elements") that

could be combined with "new elements (gleaned from prior experiences in life)" (Kolko, 2010, p. 22) to generate a new HC process framework.
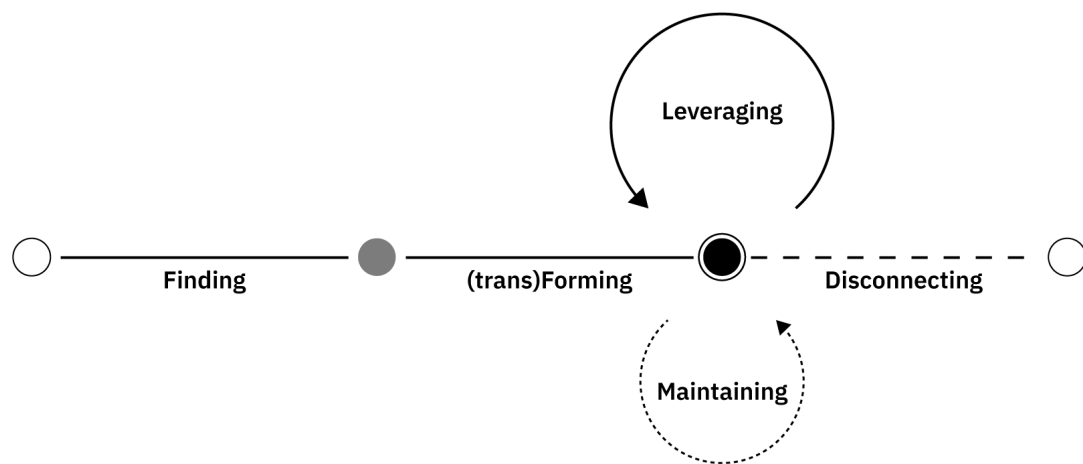
Figure 10: The Connector's Journey - a five-phase HC process framework

This abductive synthesis process resulted in a five-phase framework of human connectivity that can better support design (Figure 10). The five phases of this new framework are Finding, (trans)Forming, Maintaining, Leveraging, and Disconnecting. We refer to this new activity-based and objective-focused framework as the *Connector's Journey* as it takes the perspective of the protagonist in any HC process – the Connector. Here the relevance and positioning of each phase in the Connector's Journey is explained. In the next section, each of the phases of the new framework is explored in detail, including a reflection on how each phase appears or is absent in existing frameworks, and the activities and requirements specific to each phase.

Central to this new human-centred framework is determining the objectives of the Connector as they move through the journey. The Connector's objectives may be considered at two levels – the overall level and the phase level. At the overall level, the objective of HC is to derive value of some kind from another person. As described in the previous chapter, this value may be functional (e.g., access to an opportunity or the solution to a problem), cognitive (e.g., learning a new perspective or development of self-identity), or socio-emotional (e.g., friendship or a sense of belonging). Whether conscious or subconscious, it is the anticipation of such immediate or

potential value that motivates people to connect with others[4]. At the phase level, objectives relate to each specific phase of the journey. That is, as a person moves through the HC process, they are seeking to effectively fulfil the objective of one phase in order to progress to the next, or as is the case with the disconnecting phase, they are seeking to terminate a connection. As the Connector's overall objective is typically to derive value from the Contact, the phase in which this occurs indicates the "moment of success" in the Connector's Journey. It is in this phase that the connection ultimately bears fruit for the Connector. Identifying and labelling this phase provided a useful starting point to ground the structure of a new framework.

This phase (in which value is derived) is referred to as *Leveraging* where the phase-level objective is *to derive the sought value from the Contact*. It is the phase in which the Connector leverages the investment they have put into the connection. As described above, this value, generally received in one of three types of benefit, will determine, to a greater or lesser extent, the investment the Connector will have to make to receive it. For example, when the value is purely functional, as in the case of instrumental connections, minimal investment in the connection may be required. When the value is more personal (i.e., socio-emotional) considerable investment in the connection may be required before the Contact is willing to provide the value sought. In some cases, leveraging may be explicit and obvious (e.g., the receipt of information or an opportunity from a contact), it may also be incredibly nuanced and difficult to quantify (e.g., a feeling of friendship or belonging).

This requirement of investment on the part of the Connector alludes to the phase of the Connector's Journey that precedes Leveraging. Except for in the case of instrumental connections which are transactive in nature and generally moderated by external mechanisms (e.g., legal contracts or universally accepted social norms), a connection will need to develop to a point at which the contact is willing to provide the value sought by the Connector (i.e., so it may be leveraged). We refer to this development phase as *Forming* and describe the phase-level objective as *to sufficiently*

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[4] It is important to acknowledge that connections may occur without either Connector or Contact being consciously aware of the value they seek. For example, a person affiliating to a group may not necessarily be consciously aware or articulate that they seek belonging. Often people meet and connections begin to form with neither person fully aware of why they want to invest more time in the other. The value inherent in the connection may only become clear at a later point in time.

develop a connection such that the Contact is willing to provide the value sought. As alluded to above, the extent to which a connection must be developed will depend on the context and on the type of value the Connector is seeking from the Contact. As such, the Forming phase may be accomplished almost instantaneously, or it may occur over a considerable period of time.

To be able to form a connection with a contact, the Connector must first identify or otherwise discover a relevant contact. This requirement hints at the phase preceding Forming. We refer to this identification or discovery phase as *Finding* and describe the phase-level objective as *to become aware of a contact from whom value may potentially be derived*. Finding seems an obvious first phase of the Connector's Journey because until a contact is found, the Connector has no chance of deriving any kind of value from them. The Finding phase may occur purposefully (e.g., the Connector is looking for and hence identifies a potentially relevant contact) or by chance (e.g., the Connector is not consciously looking for a contact but stumbles across one nonetheless).

Taking the Connector's perspective in chronologically summarising the journey thus far we can therefore say: a Connector must first <u>find</u> a Contact with whom to connect; once found, the connection must be sufficiently <u>formed</u> such that the Contact is willing to provide the value sought; and once formed, the Connector must successfully <u>leverage</u> the value sought from the Contact. Our consideration of the Connector's needs throughout the journey revealed two additional objectives that point to phases that should be added to the framework.

The first objective not currently addressed by the three phases proposed thus far is the ending of a connection. Because connecting to others requires the investment of Connector's resources (e.g., temporal, emotional, financial), situations may arise in which a Contact becomes a liability or is generally not providing additional value. In such situations, the Connector may seek to end a connection. Achieving this objective demands activities distinct from the other phases and we therefore propose this as a distinct phase. We refer to this phase as *Disconnecting* and describe the phase level objective as *to cease investment in the connection*. The activity-based nature of the Connector's Journey implies that disconnecting requires action on the part of the Connector. This requirement distinguishes disconnecting from a

situation where a Connector simply loses touch with a Contact. In some instances (e.g., instrumental connections), disconnecting may be as simple as deleting all record of a Contact. In other instances (e.g., deeply embedded social connections), additional effort may be required to disconnect. As indicated in Figure 10, and much like the middle "stabilizing" stairs Knapp's staircase model (Figure 8), disconnecting may occur at any phase in the Connector's Journey.

The second objective not satisfied by the first three phases arises in one of two situations. The first situation is where a connection is sufficiently formed but there exists no immediate opportunity to leverage the connection. The second situation is where a Connector repeatedly leverages a connection over time and the connection must be kept intact (sufficiently formed) between moments of leveraging. We refer to this phase as *Maintaining* and describe the phase-level objective as *to keep an already-formed connection sufficiently formed over time.* Maintaining may only commence once a connection is sufficiently formed. If the connection continues to form such that the Connector may derive additional or different types of value from the Contact, we would consider this to be Forming, not Maintaining. Similarly, if the quality of a connection deteriorates over time and needs to be re-strengthened prior to subsequent value derivation (i.e., it is not adequately maintained) we would consider this to also constitute Forming. In other words, Forming is easily distinguished from Maintaining in that Maintaining implies a steady state whereas Forming implies further development or strengthening of the connection.

With the inclusion of these two additional phases, our new framework – The Connector's Journey – thus comprises five phases: Finding, Forming, Maintaining, Leveraging and Disconnecting. Although this new framework addresses Connectors' objectives in a broad range of contexts, one addition is required to make this framework more generalisable. This addition should address situations in which a connection is somewhat formed or even leveraged but then the context changes and additional forming must be done in order to derive a different kind of value. Because there was an already-formed connection, the connection does not need to be formed from scratch. Rather, we would say that the connection *trans*forms. We recognise this with the addition of the prefix "trans" so *Forming* becomes *(trans)Forming*. A common example of this is colleagues becoming friends. The connection may be well formed in

a professional sense and the Connector is deriving value (e.g., work related information) from the Contact (i.e., their colleague) but the two may not consider themselves to be friends so there is little exchange of socio-emotional value. At some point in the future, the two, whether they remain colleagues or not, may become friends. In doing so, their connection takes on a different nature and the value exchanged between them also changes.

The complete Connector's Journey is now: Finding, (trans)Forming, Maintaining, Leveraging, and Disconnecting (Figure 10). This new human-centred framework takes the perspective of the Connector and centres on the attainment of their connectivity objectives, overall and at each phase. Identification of an overall HC objective (i.e., the value the Connector seeks to derive from the Contact) provides a clear focus for design activities that are more likely to deliver improved HC outcomes. The deconstruction of the HC process into component parts (i.e., phases), each with its own phase-level objective, helps to further prioritise design efforts in supporting a person throughout the process. Further support is offered by the consistent and intuitive labelling of the phases in the Connector's Journey that imply what the connector is both doing and seeking to achieve in each phase. Our intention with the labels for phases in the Connector's Journey was that they are consistent across phases and that they immediately make the Connector's phase-level objective clear. For example, the objective of Finding is *to find*, of Forming is *to form*, Maintaining is *to maintain*, and so on.

Like most existing frameworks, the Connector's Journey adheres to the general three-part (i.e., beginning, middle and end) structure described earlier yet also acknowledges the dynamic nature of human connections. While some phases must be completed chronologically (e.g., a contact must be found before a connection can be formed and subsequently leveraged), in many instances, progression through the phases may not be so linear. A person may form a connection only to have it regress or change over time requiring additional forming or potential transformation.

3.6. Phases of the Connector's Journey

In this section, each phase is considered in more detail, particularly regarding the activities and requirements of each phase as well as phase start and end points and how the phases relate to each other. The sequence of phases as well as corresponding start and end points are illustrated in Figure 11. A summary is provided thereafter in Table 8 below, followed by a detailed description of each phase in the remainder of the section.
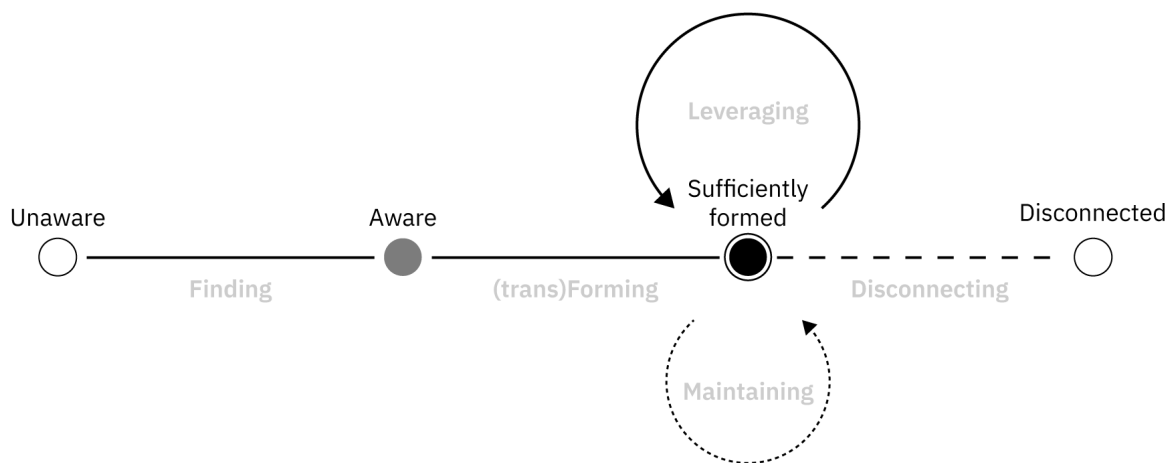
Figure 11: Connector's Journey - sequence of phases and start and end points

Table 8: Phases of the Connector's Journey

Phase	Refers to	Starts with	Success when
Finding	The identification of a contact with whom the Connector wishes to connect.	The Connector consciously or subconsciously has a need which may be satisfied by another person.	The Connector is aware of a (potentially) relevant Contact.
(trans)Forming	The (re)development of the connection to such a point that the Contact is willing to provide the value sought by the Connector.	The Connector has identified (found) a suitable contact and has committed to dedicating resources (emotional, financial, or other) to connecting to them.	The connection is sufficiently strong that the Contact is willing to provide the value sought by the Connector.
Maintaining	Keeping a connection sufficiently formed until an opportunity arises for the value to be derived (often repeatedly).	The Connector deems a connection worth keeping formed to enable the derivation of value at a later time.	The connection is kept sufficiently formed that value may be derived at a point which it is desired.

Leveraging	The Connector receiving the desired value from the Contact.	The Connector desiring value that the Contact has to offer and believing that the connection is sufficiently formed.	The desired value is derived from the Contact.
Disconnecting	The Connector breaking the connection with the Contact.	Connector recognising the Contact is no longer of value and thus no benefit is to be derived from keeping a connection intact.	Connector feels no sense of connection nor sense of obligation to the Contact.

3.6.1. Finding

Until a Contact is found, the journey may not commence. Specifically, Finding refers to the Connector becoming aware of a potentially relevant Contact. This phase begins with unawareness and ends with the Connector being aware of a potentially relevant Contact. The critical requirements of this phase include the existence of a relevant Contact and a means by which to find them. Hall (2018) states "it is not possible to have friends without first making friends" (p.1). We would add that it is not possible to make friends without first finding strangers to form into friends.

Although alluded to in some existing frameworks, the specific act (or phase) of Finding is often overlooked altogether or is wrapped up into a general kick-off phase such as "initiation" (e.g., Knapp, 1978; Porter & Woo, 2015) or "attraction" (Levinger, 1980). Most existing frameworks begin with the presumed existence of a connecting dyad or a target for connecting (i.e., a Contact). While it may be argued that phases such as initiation and attraction imply finding a Contact, such labelling does not go far enough to specify to designers or practitioners what exactly a Connector is trying to achieve or what the activities or requirements might be that support this effort. Here, we propose that since the activities involved in Finding are distinct from those in the other phases of the Connector's journey, and because finding the right person has the potential to substantially affect the outcome of the connection, this phase must be considered as distinct from the others.

The importance of Finding cannot be overstated. A chance encounter with the right person at the right time can completely alter the trajectory and outcome of someone's life. Finding the person with a critical piece of information can mean the

difference between success and failure of a business venture. Although the context for the book Ambient Findability (Morville, 2005) is online search, its tagline "what we find changes who we become", perhaps rephrased as "who we find changes who we become", is pertinent here. The way in which Finding occurs has the potential to affect all subsequent phases of the journey. While Finding is generally overlooked in existing frameworks, the importance of this phase has significant implications for design. As we will explore in much more detail in Chapter 4, there is a finite set of tactics people can employ in finding others to connect to. Because Finding is so important for the remainder of the Connector's Journey and because there are only so many ways a Contact can be found, the way a solution is designed can play a critical role in supporting this phase and increasing the likelihood that the Connector is successful in meeting their phase-level objective.

3.6.2. (trans)Forming

Forming commences as soon as a potentially relevant Contact has been found and includes all actions taken toward making an initial attempt to connect with them as well as the development of the connection. Prior to this point, no approach has been made, nor has the Connector invested any time, effort, or other resource into the connection.

Forming refers to the development of a connection to a point that it is sufficiently strong for value to be derived from the Contact. This phase begins with the identification of a specific Contact and ends with a formed connection (i.e., one that is sufficiently strong for value to be derived). The critical requirements of Forming are an obliging Contact and a means for the Connector and Contact to interact in such a way that the connection can develop. The degree to which a connection must be formed will depend on the context and the nature of the value sought. Where the context clearly stipulates the value of engagement and the value sought is purely functional, limited forming may be required as security is likely provided by external mechanisms such as social or legal contracts. Where the value sought is highly personal and requires trust and social risk taking (i.e., showing vulnerability) on the part of the Connector or Contact, forming may take significant investment of time and effort. As described earlier, there may be instances where a

Connector is not be consciously aware of the value they seek from a Contact. For example, two people may meet by chance and enjoy each other's company but would not say they have a particular end goal in mind. The connection may form nonetheless, with the Connector and/or Contact discovering, through the forming process, the value they may derive from each other.

Forming is recognised as a critical phase in most existing frameworks. Next to deterioration of connections, Forming is the phase where most attention has been paid in prior work. While some frameworks use the same terminology (e.g., "formation") to refer to this phase (e.g., Gillath et al., 2016), others use synonymous terms such as "building" (Levinger, 1980) or "cultivation" (Kram, 1983). Some frameworks dedicate multiple phases to the overall process of Forming, to provide additional nuance throughout this phase. In Knapp's (1978) staircase model (Figure 8) for example, the first five phases (i.e., Initiating, Experimenting, Intensifying, Integrating, and Bonding) arguably all relate to the forming of a connection. Social Penetration Theory (Altman & Taylor, 1973; Carpenter & Greene, 2015) explains the various stages of the formation of a connection according to breadth (i.e., the range of subjects people are willing to share) and depth (i.e., the level to which they are willing to share about a particular subject). Initially, people tend to share a limited range of information shallowly and over time, more is shared in more depth.

There is almost limitless variation in the journeys human connections may take. Therefore, while breaking the Forming phase into more nuanced phases might help to focus attention, it also makes a framework less generalisable. Adopting the Connector's perspective in this new human-centred framework, the central question for design in this phase is simply: *to what extent must a connection be formed for the Contact to be willing to provide the value sought by the Connector?* Once this is established, the designer may focus on the most effective way to support the Connector in forming a connection sufficiently.

Forming often starts from scratch, with the Connector and Contact having no prior history. In some cases, however, there is prior history, but the Connector is seeking a new type of value from a Contact. In such cases, an already formed connection may require additional forming before the value sought may be leveraged. As described earlier, we refer to this as *trans*forming. This acknowledges that, in some

cases, an already formed connection may transform through active or passive means and due to intentional or unintentional contextual changes. A common example of this, again as described earlier, is colleagues becoming friends. One existing framework that does acknowledge transformation is that of Kram (1983) which includes the phase "redefinition". In their framework, specific to mentor/mentee relationships in organisations, redefinition occurs when the mentoring period ends, and the two individuals consider each other to simply be colleagues. There is no longer a formal sense of obligation (i.e., mentor/mentee relationship) between them. Aside from this example, transforming is not mentioned in the other existing frameworks.

3.6.3. Maintaining

It is not uncommon for two people to meet and form a strong connection but the opportunity to leverage all potential forms of value might not be immediately present. For example, two people may meet and form a strong connection at a business conference but only end up collaborating several months or years later. Similarly, in many cases, a connection may form, and value may be leveraged more than once, with a period of time in between. In both situations, the connection must be maintained over time.

Maintaining refers to keeping an already formed connection sufficiently formed over time. This phase begins with a formed connection that the Connector deems worth keeping intact and ends with the continuation of the connection through active or passive means. The critical requirements of Maintaining are an already formed connection and, where necessary, a means for the Connector to maintain their connection with the Contact. The time, effort, and other resources required to maintain a connection will depend on the context, the type of connection, and the duration of maintenance. In some instances (e.g., strong friendships), several years may pass between moments of interaction and people will describe how they can "pick up where we left off". In other instances (e.g., instrumental professional connections) concerted effort will be required on the part of the Connector to maintain the connection in a sufficiently formed state.

The frameworks proposed by Porter and Woo (2015) as well as Gillath, Karantzas and Fraley (2016) both include a "maintenance" phase although the purpose of this phase is very different in each framework. In the case of Gillath, Karantzas and Fraley (2016) – a framework that considers romantic personal connections – maintenance can best be described as "keeping it together". That is, maintenance describes how different types of romantic couples keep their relationships intact and deal with challenges such as conflict. Porter and Woo (2015) on the other hand consider maintenance in the context of professional connections and highlight the difference between a person's activities and the value that is exchanged in this phase compared with the prior phases. For example, in the early stages of a connection (which they label "Initiation"), the exchange between people is more likely to be economic (i.e., instrumental), whereas the maintenance phase is characterised by social exchange (e.g., friendship), thus making a distinction between the function of the phases. In our Connector's Journey, maintenance can best be described as "keeping it alive". The connection does not change (i.e., improve nor deteriorate) in the maintenance phase, nor does the type of value the Connector seeks. Having sufficiently formed a connection, maintaining simply keeps a connection in a leverage-ready state so that no additional forming is required prior to subsequent leveraging. Like the other phases, Maintaining is not a one-size-fits-all activity. For example, Hall (2011) points out that there are sex-based differences in expectations of friends whereby males have lower expectations of same-sex friendships than females, thus suggesting that for some contacts, maintenance expectations may be higher than for others.

Understanding the importance of connection maintenance as well as the experience and needs of the Connector as they seek to maintain connections has important implications for design. Because there are cognitive and temporal constraints that limit the number of connections a person can maintain (e.g., Dunbar, 2011; Hall, 2018) any support that people can receive in helping them decide which connections to prioritise will have benefits. On the other hand, because maintaining an existing connection requires less investment than Finding and Forming a new connection (Hall & Davis, 2017), there are clear benefits to maintaining the connections a person already has, rather than continually seeking to connect to new

people, so long as existing connections possess potential value. Thus, supporting people in recognising the potential value inherent in existing connections will also be beneficial. Additionally, the longer a potentially relevant connection can be maintained, the more likely a Connector is to identify new future value that may not have been obvious when the connection first formed (Hall & Davis, 2017). This highlights the dynamic link between the Maintaining phase and the (trans)Forming phase where types of maintenance can drive transformations in a relationship and vice versa.

When connections are not maintained, they can turn dormant. People often forget about and therefore overlook their dormant connections which can be a substantial source of value (Levin et al., 2011). Because dormant connections require no maintenance and also generally do not lead to complete disconnection, Levin et al., (2011) suggests that in some cases, it can be advantageous to let connections go dormant. This is particularly true in a world where digital technologies mean that people are now more easily searchable. The implications for design here relate to the way digital technologies might be used to help shoulder the burden of connection maintenance. A good example of this is the way social media platforms such as Facebook and LinkedIn send reminders of birthdays and milestones (e.g., work anniversaries), which provide useful triggers for people to keep in touch with contacts in meaningful ways.

3.6.4. Leveraging

People are generally motivated to connect because of the value they derive from each other. While the nature of this value is often clear and concrete, in some cases it may also be subtle with neither Connector nor Contact necessarily conscious of it or able to articulate it. Regardless, when value is derived through a connection to someone else, it is in the Leveraging phase that this occurs. The Finding and Forming phases support the Connector in successfully arriving at this phase. The Maintaining phase holds the connection in a leverage-ready state.

Leveraging refers to the derivation of value from the Contact. This phase begins with a sufficiently formed connection and opportunity to derive value and ends when the value is derived. The critical requirements of this phase are a willing

Contact with the value sought by the Connector and a Connector with the attributes and means necessary to derive the value. It is in this phase that the investment in Finding, (trans)Forming and possibly Maintaining the connection pays off. Depending on the context and type of connection, Leveraging may occur naturally and seemingly effortlessly (e.g., deriving social value such as a sense of belonging from a good friend), or it may require deliberate and concerted effort (e.g., two professionals exploring potential for collaboration).

Given the critical importance of Leveraging, it is surprising to note that none of the existing models include such a phase explicitly. Terveen and McDonald (2005) do include an "interact" phase although this simply refers to the act of interacting and does not specify its purpose. One explanation for the lack of an explicit leveraging phase in existing frameworks may be that they are, by definition, value based. That is, derivation of value is implicit and is therefore generally taken for granted. Value derivation may be experienced at an incident level that is clearly identified (e.g., assistance with solving a specific problem) or at a holistic relationship level that is more nuanced (e.g., a sense of unconditional support a person receives from a friend). Even when experienced holistically however, closer analysis will likely reveal value derivation to be comprised of almost indiscernible repeated micro-exchanges between connected individuals.

Leveraging represents an important touchpoint that might be designed or supported. Because the primary reason why people invest time in connecting to others is seeking value of some kind – be it functional, cognitive, or socio-emotional – recognising the moment(s) of value derivation and supporting people in this activity seems to be critical when seeking to improve HC outcomes.

Once a connection is leveraged, it may be maintained for future leveraging. It may also be transformed, or, in some cases, it may reach a point that there is no longer value to be leveraged and Disconnecting may occur.

3.6.5. Disconnecting

The final phase of the Connector's Journey is Disconnecting. Disconnecting refers to the active and deliberate discontinuation of a connection between two people. This phase begins with the Connector recognising that the Contact has no potential or further value to offer or has even become a liability and ends when the Connector feels no sense of connection nor sense of obligation to the Contact. The critical requirement for this phase is a means for the Connector to sever ties with the Contact. The Contact must, of course, also generally be willing to disconnect. Where connections are deeply embedded and links are social, physical, digital, or contractual (e.g., mutual friends, shared possessions, social media links, or legal agreements), the Disconnecting phase may be time-consuming, formal, and complicated. Conversely, people with no such binding factors may disconnect simply by not expending any additional effort in keeping the connection intact. Importantly, and as indicated in Figure 10, Disconnecting can occur at any stage in the Connector's Journey.

Several existing frameworks include a disconnecting phase, labelled "dissolution" (Gillath et al., 2016), "terminance" (Knapp, 1978) or simply "ending" (Levinger, 1980). All three frameworks take different perspectives to explore and explain disconnection of romantic relationships although Levinger does allude to other types of close personal connections. In the case of Gillath et al., (2016), dissolution is explained in terms of the experience of securely-connected versus insecurely-connected people, with securely-connected people being far more accepting of this process. Knapp's (1978) framework describes the changes in communication that occur during terminance. Levinger (1980) takes a broader approach in describing this phase although his focus remains on close personal relationships. All three frameworks refer to the termination of the romantic bond between people rather than complete disconnection of two individuals. That is, it may be possible for partners to stop seeing each other romantically but remain friends. According to our new framework, this would not represent disconnecting but rather transforming as people remain connected but they simply derive a different kind of value from each other. Absolute Disconnecting is relatively uncommon. Most often, as illustrated in the above example, a connection is not terminated but transformed and redefined or significantly diminished.

Unlike existing models, we do not necessarily perceive disconnecting solely in a negative light, suggesting that it is the result of something going wrong in a connection. While acknowledging that this may sometimes be the case, we also perceive a positive side to disconnecting in that it can help prevent connection-overload, referring to situations where people try to maintain too many connections even when they do not hold a realistic potential of deriving future value. In the homeostatic model of social interaction proposed by Hall and Davis (2017), disconnecting can also serve a function of conserving energy and preventing freeriding. Adopting this perspective and seeing disconnecting as serving a useful and specific function, we can then consider how Connectors might be supported through design in achieving their objective in this phase. For example, normalising disconnecting would help remove some of the emotional burden of removing contacts from a person's network when they are no longer seen as relevant. This would help free up space for new, more valuable Contacts, or may remove clutter and help people to focus on their existing valuable Contacts.

3.7. Discussion

The current lack of a design-friendly Connector-centred HC process framework that is generalisable across a range of contexts hinders the ability of designers and practitioners to take targeted action toward better supporting people through the HC process and thus improve HC outcomes. The Connector's Journey represents a departure from existing frameworks in its focus on what the Connector is seeking to achieve in each key phase of the journey. This is evident not just in the general activity-based and objective-focused structure of the framework but also in the intuitive communication its component parts. Phase labels in the Connector's Journey communicate each phase's objective as well as when a phase will have been a success. For example, Finding says what the Connector is doing (i.e., finding a Contact), what the objective of the phase is (i.e., to find a Contact) and when the phase will have been a success (i.e., when a Contact is found). The same is true for all other phases.

As Altman (1973) suggests, relationship development processes "may best be viewed as a "system," with component parts functioning at different levels of activity to form a unified whole" (p.142). This supports the notion of connections being

dynamic, complex, and unique, influenced not only by factors particular to the individuals in the connecting dyad, but also by elements of the context in which connecting is occurring. Like several existing frameworks, the Connector's Journey recognises the non-linear, sometimes messy, and unpredictable nature of HC. Similarly, such a view of the HC process alludes to important links between phases, particularly how Finding might influence all subsequent phases, either positively or negatively. For example, if a contact is found through the introduction of a trusted mutual friend rather than, say an internet search, forming may happen more rapidly due to the friend's recommendation and the trust that carries. Conversely, should a connection initiated by the introduction of a mutual friend go bad, it may be more difficult to disconnect due to the sense of obligation a person may feel toward the friend and because the Connector and Contact are likely to have mutual friends which may increase the likelihood of their paths crossing in the future.

The Connector's Journey differs from most existing frameworks in its value-focused stance. That is, the Connector's Journey is framed as a route to Leveraging (i.e., value derivation). This supports its generalisability, making this framework applicable to a broad range of connection types and contexts. Whether looking for a date or a mentor, a potentially relevant Contact must still be found. A connection with that person must be formed and ultimately leveraged, probably repeatedly in both cases. Between moments of leverage, in each case the connection must be maintained. When the situation or context changes, the connection may be transformed or the Connector and/or the Contact may eventually decide to disconnect.

A further advantage of the objective-focused structure of the Connector's Journey is that it aids designers in more accurately scoping HC challenges, a critical requirement for effective DfHC. Addressing this need, the Connector's Journey acknowledges and helps to specify the unique objectives of the Connector in each phase of the HC process. This supports framing design activities in terms of phase-level outcomes (e.g., "support a project team in maintaining strong connections between moments of face-to-face interaction" rather than, as is often the case, broad overall HC outcomes (e.g., "create a better connected team"). The nuanced understanding of the HC process provided by the Connector's Journey aids designers

and practitioners in the creation of solutions that reflect people's specific needs as they move through the journey.

The abductive approach taken in the development of the Connector's Journey presents a "best guess" (Kolko, 2010) synthesis of the process a person goes through when connecting to someone. This new framework provides the scaffolding for a wave of further design research that explores the journey and the generalisability of its application in more detail. Each phase must be further explored to derive the nuanced differences and opportunities in the HC process in different contexts. This may support the development of tools to assist people in specific phases of the HC process. In addition, further research might explore how the Connector's Journey can guide the phase-level evaluation of existing design solutions, generating new knowledge to support the continued growth of DfHC.

3.8. Conclusion

To effectively design for improved HC outcomes, the HC process must be better understood. While existing HC process frameworks provide valuable insights regarding the process of connecting to others in certain contexts, their framing, context specificity, and inconsistencies unfortunately make them less suited for supporting design. The main contribution of this chapter is a new activity-based and objective-focused HC process framework, developed with designers and practitioners in mind. This new framework – the Connector's Journey – specifies the phase-level objectives of the Connector throughout the HC process. This shift in perspective, from researcher-centred to Connector-centred, and the subsequent identification of the Connector's objectives throughout the process, help to clarify the Connector's primary activity or activities in each phase as well as the requirements for the successful completion of those activities. Together, this additional nuance helps designers and practitioners to focus their efforts on those aspects of the HC process that are likely to improve outcomes. The decontextualised nature of the Connector's Journey makes it more broadly generalisable to other contexts.

4. Finding tactics for initiating the Connector's Journey

"What we find changes who we become"

(Morville, 2005)

4.1. Introduction

The previous chapter introduced the Connector's Journey – a new Connector-centric framework that deconstructs the HC process into five distinct phases. This deconstruction supports the nuanced scoping of design activities to meet individuals' phase-level HC objectives. Although an intervention (e.g., a networking event) might represent a general solution to achieving an overall connectivity objective (e.g., "create a better connected team"), the Connector's Journey supports designers in focusing on phase-level objectives, thus providing greater specificity in the framing of design objectives and the targeting of design efforts (e.g., "support distributed team members in *maintaining* key connections"). Such specificity subsequently supports precise scoping of phase-level challenges, leading to solutions more likely to meet the requirements of individuals in a given context.

To achieve a person's overall HC objective and derive sought value through leveraging a connection, a sufficiently strong connection must be formed. Prior to forming a connection, a relevant contact must first be found. The focus of this chapter is to further interrogate *Finding* – the first and arguably most overlooked phase of the HC process.

As defined in the previous chapter, *Finding* refers to the Connector becoming aware of a (potentially) relevant Contact. This phase begins with unawareness and ends with the Connector being aware of a target Contact. The critical requirements of this phase include the existence of a relevant Contact and a means by which to find them. Not only is Finding a prerequisite to the derivation of value from someone (i.e., in order to connect with someone, they first must be found), how Finding occurs has the potential to influence all subsequent phases. This highlights not only the

importance of Finding as an activity in itself but also how Finding relates to the phases that follow.

Finding, as a distinct objective and activity, has attracted little attention in the existing knowledge base. In existing frameworks Finding is rarely mentioned as a distinct phase. Instead, existing frameworks tend to bundle Finding into a general kick-off phase labelled, for example, as "initiation" (Kram, 1983), "attraction" (Levinger, 1980) or "contact" (DeVito, 1991). Such labels imply that a Contact has already been found, thus overlooking the specific activity of finding. Others imply that Finding is synonymous with pairing, labelling the initial phase as "match" (Terveen & McDonald, 2005). The specificity of such labelling makes a framework less generalisable to other contexts. The general connection-centred or researcher-centred nature of most existing frameworks helps explain why the Finding phase has largely been overlooked. Researchers have been more interested in what happens during the process of connecting or once people are connected rather than whether a connection happens at all or how two people came to be connected in the first place.

The link between how people find others to connect to and the subsequent phases of the Connector's Journey has important implications for design. Carefully structured support for the Finding phase can affect the trajectory of the rest of the journey. Improving the outcomes of the Finding phase through design has the potential to improve the efficiency, effectiveness, and the subjective satisfaction of the rest of the journey. For instance, a connection found through the recommendation of a colleague may more easily be formed than a 'cold' connection where the desire to form may mainly reside with one party.

Finding can focus on a specific individual (e.g., the Head of Innovation at a particular firm); on a category or type of person (e.g., innovation managers in the health sector); or on no one in particular. In the first two cases, finding is an intentional activity, motivated by a clear objective. In the latter, finding can seem coincidental and haphazard. People can seem to simply bump into each other unexpectedly. Anecdotal evidence suggests that both intentional and unintentional tactics can lead to valuable connections.

As the initial phase of the HC process, Finding is a logical starting point for understanding how to improve HC outcomes. Not only does the HC process

necessitate Finding (i.e., a connection cannot develop until someone is found to connect with), the outcome of the Finding phase (i.e., the specific Contact found) can affect how a connection develops and its overall success. A focus on Finding recognises the process-driven approach to HC and the importance of contact relevance. It also emphasises practical approaches to achieving the activity of finding. This has, to some extent, been explored within human computer interaction research into social matching systems which adopt the principles of object-based or content-based recommender systems to bring people together in physical and online contexts (see Terveen & McDonald, 2005 for a review). At their core, these systems are designed to help people find each other. Here we propose that more can be done to support other approaches to finding people and thus lead to an improved HC process.

Supporting designers in creating interventions that improve Finding outcomes requires a deeper understanding of the available tactics a Connector may adopt in completing this phase. Observed patterns of HC behaviour indicated there would be a finite number of possible tactics people can adopt in finding (potentially) relevant contacts. Having situated Finding as the first phase in the Connector's Journey in the previous chapter, here we interrogate Finding to derive the unique tactics a Connector may adopt in successfully completing this phase of the journey. Specifically, in this chapter we seek to identify how Finding occurs. This is achieved through two empirical studies in which we identify five unique Finding tactics. This work provides designers with a deeper and more nuanced understanding of the HC process, to better scope HC challenges and focus design activities, to generate interventions that are more likely to improve HC outcomes, and to more confidently and specifically evaluate relevant existing interventions.

4.2. Study 1a – Deriving distinct Finding tactics

The objective of this first study was to identify the unique tactics people can adopt in Finding others with whom to connect. Participants were attendees at a multi-disciplinary creative leadership conference in Amsterdam (NL). Though all participants of the conference were similar in their pursuit of personal leadership development, their high cultural, professional, and demographic diversity enabled the capture of a wide range of perspectives and experiences (Hanson et al., 2019). The study involved a survey that was distributed to all conference attendees. We expected to derive a limited set of Finding tactics, thus providing insight regarding practical design requirements of the Finding phase. Our goal with this study was to identify a discrete set of tactics and clearly differentiate these from each other.

4.2.1. Method

The foundational and exploratory nature of this study justified a qualitative approach that offers deeper understanding (Robson & McCartan, 2016). To derive all possible Finding tactics, we sought a large number of reported instances in which contacts were found. We selected a survey as the ideal instrument for data collection as this allowed us to canvas a greater number of participants for gathering structured responses (Robson & McCartan, 2016). We were not seeking to understand the experience of Finding. Rather, our objective was merely to derive Finding tactics. It was anticipated that saturation would be reached quickly.

The survey was initially tested and iterated with research colleagues not directly involved with the study. Once finalised, the survey was printed for physical distribution at the conference and created as a digital version in Qualtrics for online distribution by the conference organiser. This combination of analogue and digital forms meant that people who had attended the conference without a digital device suitable for completing the online version were not excluded. The survey consisted of two parts. The first part asked for basic demographic data as well as participants' general experience of connectedness. The second part of the survey asked participants to think about (one of) their most valuable contact(s) and describe how they came to be connected. Each participant was asked to think of one personal and one professional connection.

Participants received the following instructions:

> *Think about your most valuable [personal/professional] connection (e.g., best friend, life partner, mentor), not including extended family.*
>
> *It is important that you clearly have one person in mind before you proceed. If you have many, just choose one.*
>
> *In what year did you first connect with this person? _____*
>
> *Please describe how you came to be connected (the setting, the circumstances and what happened).*
>
> *Provide as much detail as possible. It can help to think of where you were and the chronological chain of events.*

The question about the year of connection was included to contextualise responses to aid participants in more accurately recalling the circumstances in which they connected. Asking for an example of Finding both personal and professional connections was intended to provide a broader sample for our analysis and to enable comparison across contexts. This points to an example of the generalisability of the HC process across societal and organisational contexts. We expected to see similarities in how contacts are found across both personal and professional contexts, which would suggest that Finding tactics are not context specific.

Paper-based responses were transcribed and collated with digital responses. Data were coded using thematic analysis (Braun et al., 2019), focusing on repetitions, similarities and differences (G. W. Ryan & Bernard, 2003), to derive an exhaustive list of themes from participant responses. Consistent with Braun et al, we sought "shared meaning-based patterns" whereby "meaning occurs in multiple and varied contexts" (Braun et al., 2019, p. 845). For example, several participants mentioned they found contacts through introductions although the ways such introductions were described and the contexts in which those introductions were made varied across personal and professional contexts. As noted above, our goal was to derive a set of distinct tactics with clear definitions. Ideally this would reach saturation, meaning that no new themes could be identified. Themes, derived from an iterative coding process, were given descriptive titles that encapsulated the Finding tactic adopted in each case. Themes were reviewed by the second researcher and instances that sat at the fringe of multiple tactics were discussed. Careful attention to resolving agreement on such
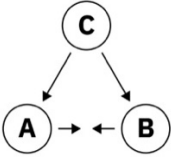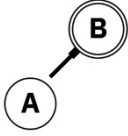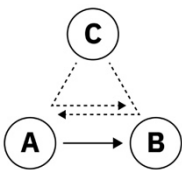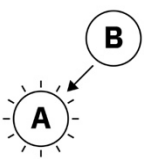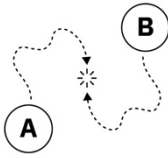
fringe cases helped refine the definition for each tactic. Importantly, such discussions only occurred with regard to fit, not scope. That is, our question was always whether a fringe case was an example of one or another of the already identified tactics and not whether an additional tactic was required.

4.2.2. Results

A total of 62 complete responses were received, representing 124 instances of Finding (one each for personal and professional connections). Complete responses were any response which provided adequate information about how a Contact was found. Incomplete responses were disregarded, for example where a participant described the setting in which a connection was made but not how it happened (e.g., P62: "[we met] 25 years ago at a conference"). Analysis of the data revealed five distinct tactics that explained how people found others to connect to. We labelled these tactics: Stipulated, Sought, Suggested, Seduced, and Serendipitous.

Consistent with the human-centred framework of the Connector's Journey, all Finding tactics consider the perspective of the Connector in a connecting dyad. Three characteristics that aid in the categorisation of tactics are intentionality, breadth and the number of agents involved. Intentional tactics are those where the Connector has a deliberate intention to connect, and non-intentional tactics are those where connections arise as a result of circumstance rather than deliberate action. Breadth refers to the level of focus adopted by the Connector, where broad indicates a general category of potential contacts (e.g., innovation managers in the health sector) and targeted indicates having a specific Contact in mind by name or role (e.g., Head of Innovation at a particular firm). Finally, in referring to the number of agents involved, dyadic tactics involve only the Connector and the Contact whereas triadic tactics require involvement of an external agent. Agents can be human or non-human (e.g., algorithms or various software applications). Each of the Finding tactics is summarised in Table 9 and explained in detail below.

Label and Definition	Example	Visualisation A=Connector, B=Contact, C=external event or agent	Characteristics
Stipulated connections: An external event or agent places two people in close enough proximity that they interact and find each other as a result.	P30: "[We met] through a coaching course. We had to practice the coaching method on each other"		Non-intentional Broad Triadic
Sought connections: The deliberate and active search for a specific person or type of person.	P55: "I asked a person that worked with him to introduce me to him"		Intentional Targeted or Broad Dyadic
Suggested connections: An external agent recommends two people to each other, often supported by a personal introduction.	P19: "Someone in my network connected me to him because of our shared vision and passion"		Non-intentional Targeted Triadic
Seduced connections: The attributes or actions of a person makes others aware of them and attracts others to them.	P79: "He offered me a job because he had seen what I had done in other offices."		Intentional Targeted or Broad Dyadic
Serendipitous connections: Two people randomly come into contact with each other, seemingly by coincidence.	P109: "Random. Met in the same bar"		Non-intentional Broad Dyadic

Stipulated refers to a tactic in which an external agent explicitly pairs the Connector and Contact or places them in close proximity resulting in them connecting. In the case of personal connections, close proximity was explained, for example, by people being placed in the same class at school or being paired up in a course (P30: "[We met] through a coaching course. We had to practice the coaching method on each other"). In professional contexts, close proximity was also generally

explained by people working together, either as peers or as superior/subordinate (P25: "She was my employee and I her boss"). Stipulated connections result from the actions or instructions of an external agent (e.g., person or software application) and are not necessarily primarily intended to connect two specific people. That is, the primary intention for placing people together may be to complete a task, not to form a connection. Connecting is an unintended by-product of being placed together. Such connections are therefore triadic, broad, and non-intentional. Stipulation may be direct (e.g., "Person A, you will be working with Person B for this next exercise") or indirect (e.g., Several people placed the same proximity-enhancing group such as a project team but not explicitly paired with each other).

Sought refers to a tactic in which the Connector actively seeks out a specific Contact or type of contact. Several participants mentioned their use of dating apps to seek personal connections while others leveraged their existing connections to seek new ones (P55: "I asked a person that worked with him to introduce me to him"). In professional contexts, the most common Sought connections arose in recruitment or service provision (P35: "I was searching for someone who would add diversity to a project team"). Sought connections result from the deliberate action of the Connector seeking either a specific Contact or a category of potential Contacts and are therefore intentional, targeted or broad, and dyadic.

Suggested refers to a tactic in which an external agent voluntarily introduces the Connector and Contact. The most common personal example of a Suggested connection was friends introducing each other based on perceived mutual interest (P65: "A common friend of ours introduced us with each other because he thought that we both share a similar mindset and work context"). Similarly, in professional contexts, the most common Suggested connections were recommendations based on a common interest or assumed potential for value exchange (P19: "Someone in my network connected me to him because of our shared vision and passion"). Suggested tactics tend to be aimed at a specific Contact and result from the actions of an external agent (e.g., mutual friend or matching algorithm) and are therefore non-intentional, targeted, and triadic.

Seduced refers to a tactic in which something about the Connector (e.g., a physical attribute, a possession, their behaviour, or something they communicate)

attracts Contacts to them. Personal examples of Seduced connections related, for example, to responses to classified advertisements (P68: "My friend's mother responded to my mother's [noticeboard] message"). In professional contexts, it was a person's past performance that most often led to a Seduced connection (P79: "He offered me a job because he had seen what I had done in other offices."). Seduced tactics are generally deliberate and may be aimed at a specific Contact or a category of potential Contacts. No external agent is required. Seduced connections are therefore intentional, targeted or broad, and dyadic.

Serendipitous refers to a tactic in which two people discover each other seemingly by chance. While this type of finding does require a degree of coincidence (e.g., neither person is actively seeking a connection), probability of chance encounters can be influenced by increasing proximity for instance. Examples of serendipitous finding were diverse for both personal and professional connections. Serendipitous personal connections happened in unexpected places (P111: "We met on a train platform on the way home from work", or P19: "One evening we ended up sitting on the same couch putting on our dance shoes"). This unexpectedness was also evident in the case of professional connections (P109: "Random. Met in the same bar"). Serendipitous connections require no input from an external agent, are not aimed at a specific Contact, and occur seemingly by accident making them non-intentional, broad, and dyadic.

4.3. Study 1b – Supporting or challenging the Finding tactics

The previous study identified five distinct Finding tactics. The linked objective of this second study was to gather evidence to support or challenge the idea that saturation was met. The setting for this study was a large business conference in Central Europe. Whereas the first study asked participants to think about a valuable connection they had made some time in the past, this study asked participants to focus only on connections made during the conference. Due to the short duration of business conferences (typically 1-5 days) and the fact that making new connections is a primary reason for attendance (Chai & Freeman, 2019), this context provides access to many instances of people connecting, still fresh in the minds of participants. This mitigates the potential risk of inaccurate recall. This study involved connectivity-

related questions being included in the official feedback survey sent to all conference participants on the last day of the conference.

4.3.1. Method

Survey questions were written to be integrated into the official participant feedback survey sent out on the last day of the conference. The survey was tested on research colleagues not directly involved with the study to ensure that questions were clear, simple, and unambiguous (Robson & McCartan, 2016). Once finalised, the survey was created in Qualtrics, and a link was generated for distribution by conference organisers. Following three general conference satisfaction questions, participants were asked to think of the most valuable connection (MVC) they made during the conference and to indicate, by way of multiple-choice response, how that connection was found. The choices offered were the five tactics derived in Study 1 as well as "Other". Next, participants were asked to describe how the connection happened. Finally, participants were asked to indicate the proportion (as a percentage) of all connections made at the conference according to the five tactics. Although the prevalence of the tactics was expected to provide interesting insights regarding attendee behaviour at business conferences, this was secondary to the primary aim of the study (i.e., to support or challenge the five tactics) and hence no statistical analysis was planned.

Text responses (i.e., participants' descriptions of how connections happened) were analysed separately to ensure participants correctly allocated responses. A subset of these responses was again reviewed by the second researcher. Particular attention was given to "Other" forms of connection to check if these were truly "Other" or did in fact fit into one of the five categories. Again, fringe cases were discussed and resolved. Of the qualifying participants (n=474), 67% were female and 22 nationalities were represented.

4.3.2. Results

A total of 551 participants completed the survey. 35 responses were disregarded because participants mentioned they made no new connections, leaving a total of 516 valid responses to be considered for further analysis. Of these, 74 participants indicated that their MVC occurred as a result of a tactic "Other" than the five tactics

derived in Study 1, however 42 provided no description of how their MVC happened thus making these responses impossible to evaluate. Of the remaining 32 participants who selected "Other", and did provide a description of how they found their MVC, all could be coded according to the five-tactic framework. Having adjusted these "Other" responses, all 474 responses fit within the five tactics previously identified providing additional support for the list of five tactics.

While this study sought only to challenge or gain support for the tactics, the prevalence of each Finding tactic (MVC and overall connection figures given in Table 10) reveals interesting patterns. The difference in number of participants responding about the MVC and overall connections made is explained by some participants only completing the first section of the survey (i.e., questions relating to their MVC) and not continuing to complete remaining questions. Results for overall tactics are consistent with expectations for a conference where the setting creates many opportunities for participants to "bump into" each other, hence the high percentage of Serendipitous connections. Conversely, the relatively low prevalence of Seduced connections can likely be explained by the limited opportunities for attendees to stand out. The same is true of Stipulated connections as there are likely few moments where an external agent or event places people in contact. Participants provided one example of where this did occur, describing how some conference speakers would ask people in the audience to "turn and talk to your neighbour". Further research might explore such trends to understand how various venues utilise different tactics. Such an understanding has important implications for design. Rather than leaving HC to chance, opportunities may be purposefully designed that support people in Finding Contacts in different ways, thus influencing other phases of the Connector's Journey and improving HC outcomes.

Table 10: Prevalence of each finding tactic, for most valuable connection (MVC) and Overall.

	n	Stipulated	Sought	Suggested	Seduced	Serendipitous
MVC	474	7.6%	20.7%	21.1%	9.3%	41.2%
Overall	407	18.4%	19.3%	15.9%	10.2%	36.2%

4.4. General discussion and further research

A nuanced understanding of each Finding tactic can support designers and practitioners in scoping the requirements of generative design activities in accordance with the people to be connected and the context in which connecting occurs. Taking a *phase-level* (rather than *overall*) perspective in specifying an individual's connectivity objectives adds critical specificity to a design brief. This phase-level perspective can also support evaluative design activities, helping to explain the success or failure of a solution in terms of the Finding tactics a design supports or fails to support.

When designers and practitioners are specific about the tactic that will most likely generate the desired outcome (i.e., Finding a relevant contact), design requirements become clear. Stipulated connections, for example, require an external agent or event with the requisite power to cause the Connector and Contact to interact and a suitable mechanism for such interaction to occur. Sought connections require mechanisms that effectively facilitate an individual's search for some desirable characteristic or individual among a population. Suggested connections require an external agent (e.g., a mutual friend or matching algorithm) with relevant knowledge of the dyad to make a useful introduction, an intention for the introduction, and mechanisms through which to make and follow up on the introduction. Seduced connections require a sufficiently desirable attribute of the Connector, a channel through which to communicate the desirable attribute, and a mechanism that facilitates the Contact in responding. And finally, Serendipitous connections require a context that influences the likelihood the Connector and Contact interact and that ensures both are open to unexpected connections.

Understanding the differences between the five tactics and the factors that contribute to the success of each also provides designers with the requisite vocabulary and lens through which to consider design alternatives. Proximity, for example, is essential in the cases of indirect Stipulated connections (i.e., where people are placed in close proximity but not necessarily as dyads) as well as Serendipitous ones. In the case of indirect Stipulated connections, it is through the proximity of people over time (e.g., playing on the same sports team or working in the same project team) that connections form. Serendipitous connections, on the other hand, necessitate

proximate contexts in which strangers bump into each other. In both cases, it is the facilitation of people naturally bumping into each that has important design implications.

Stipulated and Suggested tactics are unique in their requirement of an external agent that facilitates the connection. In the case of Stipulated connections, the external agent does not necessarily have a specific connectivity-related intention when putting people into close proximity (e.g., assigning people to teams or classes). In the case of Suggested connections however, such connectivity-related intentionality is explicit. The quality of Suggested connections will therefore depend on the requisite knowledge and ability of the agent making the connections. Algorithms increasingly mimic the work done naturally by human agents by trying to gather relevant information about individuals who should connect. The unique tension and opportunity here are limits and capabilities to manage quantity and quality of information about others. Because the role of selector or matchmaker is assumed by an external agent in both Stipulated and Suggested connections, both tactics have important design implications in contexts where diverse connections are desired. This is explained by the external agent potentially having a different measure of relevance so they are more likely to stipulate or suggest Contacts the Connector would not normally seek out on their own. Note that some other tactics may include an external agent but this is not required. For example, in the case of Sought connections, a person may reach out to an existing contact to request an introduction to someone that person is already connected to.

The success of the Seduced tactic depends not only on the seductive qualities of the Connector but also on the availability and willingness of a Contact to adopt a Sought tactic in response. That is, while the Connector may possess and communicate a desirable attribute, they will only make a connection if a relevant Contact notices them and seeks them out. This points to the generally inextricable nature of Connector-Contact ties. While many human connections can appear mutual and balanced, there often exists a more nuanced division of roles between the Connector and Contact. The analysis within this chapter provides needed clarity and specificity to structure and implement the design interventions that guide the journey of the Connector and lead to improved connections. While our focus has been on the

Connector, the role of the Contact is equally crucial throughout the connectivity journey. Effective design interventions should consider the experience of both sides of the dyad as well as the role of external agents where relevant. However, taking clear perspectives in scoping and framing a design opportunity is also essential as the tactics are directional.

Despite the generalisability of the Connector's Journey presented in the previous chapter and built on here, human connections are as individual and nuanced as the individuals connecting and the contexts in which connections occur. This hints at an exciting programme of research that explores the nuances of the phases of the HC process in more depth. The Finding tactics presented in this chapter can serve as a starting point for much of this research. Related future research may consider, for example, the sequence of phases for various types of personal and professional connections, the specific measures of success for each phase in various contexts and the requirements for successful transition between phases. As well as deeper exploration of the remaining four phases – (trans)Forming, Maintaining, Leveraging and Disconnecting – several aspects of the Finding tactics warrant further investigation, not least the increasingly dominant role of digital solutions (e.g., algorithms and other software applications) in facilitating the Finding of relevant and valuable contacts.

Although an in-depth consideration of each tactic's requirements fell outside the scope of this work, even this high-level derivation of requirements provides a starting point for critical analysis of existing or proposed designs. Importantly, the set of requirements outlined here can lead to a range of design solutions. For instance, there are many possible ways a person can search for a characteristic among a population, from browsing (i.e., "I'll know it when I see it") to a focused search (i.e., "I know exactly what I'm looking for") based on specific criteria.

Another area requiring deeper exploration relates to the psychology and individual experience of each tactic. Such research would aid understanding of how some people are more or less predisposed to certain tactics over others. It seems logical, for example, to assume that extraverted individuals would be more comfortable adopting tactics in which direct connection with potential contacts or some kind of public display is required (e.g., sought or seduced respectively). Less

socially confident individuals, on the other hand, may feel more comfortable with tactics in which connecting seems to happen to them (e.g., stipulated, suggested, serendipitous) so they can avoid the potential anxiety of making the first move for fear of rejection (Lavigne et al., 2011). In addition, the subjective experience of each tactic may provide deeper understanding about how people perceive the tactics and the value attached to them. For example, serendipitous connections often result in fun stories (e.g., "We both went to collect the same suitcase from the baggage carousel and started chatting") which may potentially add value beyond that derived through the connection itself.

And finally, further research might also investigate the conversion rate of tactic types in different contexts and/or the type of value derived through different tactics. This would support understanding regarding which tactics consistently lead to the most valuable HC outcomes. For example, it would be fair to assume that a suggested connection might be more likely to lead to a positive HC outcome as such connections are made with a degree of intent (e.g., the person making the suggestion already has potential value in mind). Similarly, non-intentional tactics (e.g., stipulated and serendipitous) seem more likely to lead to more diverse, weak-tie connections as they avoid biases and pre-judgements that support homophilic connectivity behaviour. This has important implications for organisations seeking innovative or creative outcomes from their people.

4.5. Conclusion

In this chapter, we interrogate Finding, the first phase of the Connector's Journey, and derive the five tactics a Connector may adopt in finding a Contact with whom to connect. Our consideration of the requirements and attributes of each tactic as well as the interplay between them highlights practical implications for designers seeking to take a more deliberate approach to designing for improved HC outcomes. Specifically, the additional nuance afforded by this derivation supports the scoping of generative design activities aimed at addressing phase-level HC objectives and evaluative activities that seek to explain and enhance outcomes.

Finding, as introduced in the previous chapter and again highlighted here, is often overlooked in existing HC process frameworks. This is surprising given the

critical importance of Finding in the HC process, both in terms of its requirement for the HC process to commence and its potential effect on the success and experience of all subsequent phases. Evidence of all five tactics being adopted in personal and professional contexts, as observed in study 1, provides additional confidence regarding the generalisability of the Connector's Journey across contexts. Regardless of the context, for the Connector's Journey to commence a contact must be found and, as this work has shown, there are but five ways that this can occur.

5. Behaviour Settings

"It seems that one can hardly avoid, even with the strongest intentions,
doing as the Romans do when one is in Rome"

(Barker, 1960, p. 5)

5.1. Introduction

A key insight from our literature review (chapter 2) is that human connectivity challenges and solutions to improve HC outcomes are often narrowly framed around the connectivity-related skills of a person (e.g., conversational or listening skills in networking situations) (e.g., Casciaro et al., 2016; Zack, 2019). This, however, negates the complexity of HC and how a range of contextual elements can exert powerful influence on HC outcomes (Mandeno & Baxter, 2021). From a 30-second conversation in an elevator, to a relaxed team lunch in a local restaurant, to a multi-day international conference, the contexts in which people seek to connect are numerous and varied. While the connectivity-related skills required by people within each context are certainly important, so too are the other contextual elements that may help or hinder the HC process.

Even when contextual considerations are included in design activities however, designers and practitioners often take a narrow focus which emphasises a single intervention point and does not adequately consider how the intervention influences and is influenced by the wider context. In addition, and as highlighted in chapter 2, the pursuit of other design objectives (e.g., optimisation, digitisation, automation) may radically alter people's routine(s), the role(s) people play, and interactions between people in a particular context, which can unwittingly result in the degradation of HC potential. This contextual neglect is understandable, particularly when the focus is on a single touchpoint and the complexity of the context can be difficult to grapple with. Designers and practitioners would benefit from the ability to methodically analyse and intervene in a way that considers, and potentially influences, the entire context.

Behaviour setting theory (Barker, 1963) offers a powerful, grounded, and structured approach to deconstructing a context to identify those elements that contribute, positively or negatively, to HC outcomes. This includes not just cyber-physical elements that make up contexts, but also social and psychological elements that influence the behaviour of people within a context. At a detailed level, behaviour settings offer an ability to zoom in on a specific element such as a designed artefact or a skill of a user, to determine its role in supporting the Connector in their successful navigation of a setting. Behaviour settings also offer an ability to zoom out to see the interrelationships between elements and how the modification of one element may influence other parts of the setting.

In this chapter, behaviour settings are shown to be particularly useful in supporting both evaluative and generative DfHC activities. To this end, we first introduce behaviour setting theory and the behaviour settings approach including the behaviour settings canvas. The behaviour settings approach is used to conduct a detailed analysis of four unique HC settings. All four are examples of contemporary work situations (introduced in chapter 1), characterised by diversity of participants and lack of clearly defined social operating system (i.e., unfamiliar people and unfamiliar context respectively). Such situations represent extreme contexts (Eisenhardt, 1989) in which HC is both a desired outcome and a challenge for many participants. Three of the settings are situated within the broader context of multi-disciplinary business conferences and the fourth is situated in an experimental 'smart' workplace within the headquarters of a multinational organisation. The settings are studied using qualitative and ethnographic techniques including immersion in all four settings. The primary design activity in all four cases can be considered evaluative rather than generative in that the behaviour settings approach is mostly used to evaluate and explain HC outcomes in existing interventions. This evaluation lead to insights from which changes in the setting can be generated. In one case, outputs of the setting-focused evaluation are instrumental in informing the design of the subsequent year's conference, thus supporting generative design.

This work demonstrates the critical importance of taking a holistic approach to the contextual evaluation of the design of activities intended to improve HC outcomes. It is, to the best of our knowledge, the first time that behaviour settings

theory and methods have been used in the analysis of contemporary work situations to better understand the HC process, thus this work contributes to the growing bodies of behaviour settings literatures. The outcomes of the research conducted across the four case studies, highlight specific elements of behaviour settings that influence the HC process and allude to potentially generalisable principles that can guide generative design activities toward favourable HC outcomes.

5.2. Behaviour Settings

5.2.1. Behaviour settings theory and relevance

Behaviour settings are "small-scale social systems composed of people and physical objects configured in such a way as to carry out a routinized programme of activities within specifiable time and place boundaries" (Wicker, 1992, p. 166). Examples of behaviour settings include a university lecture, a self-checkout at a grocery store, and a medical check-up. Behaviour settings theory was developed and tested by social scientist Roger Barker between the 1940s and 1970s (Barker, 1978). Barker, who was instrumental in the development of the field of ecological psychology, sought to explain the motivational influence of the non-psychological environment (Barker, 1960). Behaviour settings revolve around behaviour episodes or "standing patterns of behaviour", where there is a synomorphic relation between them and the environment (Barker, 1963; Schoggen, 1983). That is, behaviour episodes exhibited by people within a behaviour setting consistently follow similar patterns and are supported or otherwise influenced by contextual elements in the setting including objects and other people. Barker (1963) describes behaviour episodes as "natural units of molar behaviour with the attributes of constancy of direction, equal potency throughout their parts and limited size range" (p. 25). This shifts the perspective from a molecular (i.e., close-up) level (as had been the tradition in psychology) to a molar (i.e., big picture) level (Aunger, 2020), thus providing a more holistic view of the elements external to the individual which could help explain behaviour. Behaviour settings proved to be a very powerful tool, enabling the prediction of behaviour across settings with a great degree of accuracy (Barker, 1968).

People play a vital role in behaviour settings and are, in the words of Barker, "sine qua non" (Barker, 1978, p. 217). That is, although people can be expendable in a setting (i.e., one person can often be exchanged for another), people are the only thing that a setting cannot be without. People contribute to behaviour settings at two levels, namely as "things" (i.e., internally constrained and independent of external events), and as "medium" (i.e., externally constrained and dependent on external events for the form and energy characteristics they exhibit). While people, as individuals, are independent and play unique roles in a setting, it is the collection of people interacting in distinct ways (together with other things and features) that gives structure to a setting. Other important aspects of behaviour settings, as it relates to people are that: people are the most malleable of things in a setting (i.e., people can adapt and take on different roles throughout the behaviour episode); each setting type has an optimal population and through the addition or subtraction of people a setting may function less optimally; the rules that influence behaviour in a certain type of setting will remain constant even when the setting's population increases or declines (Barker, 1978). Finally, people (and objects) transform as they move from one type of setting to another (Barker, 1963). For example, the same student may take on very different roles and behave quite differently in a lecture theatre than they do at a dinner party with family.

In addition to people, two other features of the milieu also contribute to the regulation of behaviour in behaviour settings. Fuhrer (1990) makes a distinction between "fixed-feature elements" and "semi-fixed feature elements", and between "architectural elements" and "topographical elements". Fixed feature elements are those that are built in and are generally immoveable such as walls, floors, traffic lights, electric and plumbing systems. Semi-fixed feature elements are those elements that can be moved around such as chairs, books, lamps. Architectural elements are essentially man-made fixed-feature elements whereas topographical elements refer to the layout of a setting. It is this interdependence of people and things (i.e., various elements) combining to regulate behaviour that give a behaviour setting its unique structure and meaning and help to define its parameters. That is, the boundaries of a behaviour setting may be defined, to a great extent, by the interdependence of

elements where those elements that exhibit interdependence are considered part of a setting and those elements that are wholly independent are not.

For individuals themselves, behaviour settings are important as they help people to make sense of all manner of situations. The overall environment as well as people and other things within it provide clear and powerful normative cues that regulate behaviour. This reduces the necessity to relearn behavioural expectations as a person moves between settings, regardless of how extremely different they are – from waiting for a bus, to entering a library to study, to watching a live football match in a stadium with 70,000 screaming fans. Once familiar with a setting, either through prior experience or knowledge gained through other means, a person will be equipped to participate in that setting with an understanding of the role they might (or must) play and what is expected of them. When performance deviates from expectations in the setting, motivational and normative structures of the setting are often challenged. This can cause discomfort for individuals who, as a result, seek to correct their behaviour.

For designers and researchers, behaviour settings are useful for the understanding of all interdependent elements in a context including the role of each element, the relationships between elements, and how elements interact to regulate the behaviour of a setting's participants. As such, behaviour settings can be powerful tools in both evaluative and generative design activities. Used evaluatively, behaviour settings can support designers and practitioners in identifying and understanding those elements that influence the success (or failure) of existing designs. Used generatively, behaviour settings can support designers and practitioners in identifying where to introduce changes to a setting to best support the attainment of desired outcomes. Additionally, the interdependence of elements of a behaviour setting facilitate the creation of what Wicker (1992) refers to as "cause maps", assisting designers and practitioners in determining how changes to one part of a setting may cause changes in other parts, thus providing an invaluable big picture view of a design activity.

The growing recognition of the usefulness of behaviour settings theory reflects a general evolution in behaviour settings research. Barker's original work, and much of the research in the decades that followed, was descriptive in nature and sought to

identify and understand behaviour settings in communities (e.g., classroom, church) (e.g., Barker, 1978; Wicker & Mehler, 1971) and in specific settings (e.g., video games) (Clarke & Duimering, 2006). More recently, researchers have acknowledged the prescriptive potential of behaviour settings theory in informing the design of interventions for positive behaviour change. Key proponents of the prescriptive application of behaviour settings theory are Aunger and Curtis (2016) who adopt behaviour settings in Behaviour Centred Design. This work, aimed at positive behaviour change in health contexts, inspired the creation of the Behaviour Setting Canvas (Baxter et al., forthcoming).

5.2.2. The behaviour setting canvas

The behaviour setting canvas maps out the critical elements of a behaviour setting onto one page (Figure 12). This tool addresses the inherent complexity of behaviour settings created by the broad range of interdependent elements comprising them (i.e., people, objects, and other features of the milieu). In early behaviour settings research, behaviour episodes and corresponding settings were meticulously documented in great detail. From this research, patterns emerged from which categories of relevant elements could be identified (see, for instance, Aunger & Curtis, 2016; Curtis et al., 2019). It is these categories of elements that give the behaviour setting canvas its structure. This structured organisation of a setting's elements onto a single page facilitates the data collection process, acts as a boundary object to support communication, and provides designers and practitioners with a common view of a behaviour setting. Having a common view emphasises the information that is needed to complete the inquiry. This common view also indicates the interdependencies between elements.

Target behaviour:		Setting: Date: Time:		Stage:	
People	Roles	Competencies		Motives Create, Lust, Hunger, Comfort, Fear, Disgust, Attract, Love, Nurture, Hoard, Affiliate, Status, Justice, Curiosity, Play	
Props	Roles (prop related)	Attributes (prop related)			
				Norms Injunctive Descriptive	
Infrastructure	Roles (infrastructure related)	Attributes (infrastructure related)			
Routine					

Behaviour Setting Canvas

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Figure 12: The behaviour setting canvas

The elements of the behaviour setting canvas are summarised in Table 11 and described in more detail thereafter. The behaviour settings example provided in Table 11 is that of a supermarket checkout experience. This setting is chosen as it is familiar to most people, thus supporting clear illustration of the differences between elements of the canvas. The items included in the example column are by no means exhaustive but are intended to simply illustrate what is meant by each element.

Element	Description	Example (Supermarket checkout)
Target behaviour	The behaviour episode (standing pattern of behaviour) that people are motivated to perform and that is regulated by the behaviour setting.	Complete a supermarket checkout transaction.
Stage	The backdrop (architectural and/or topographical) within which the behaviour setting is situated.	The checkout area of the supermarket.
Routine	The sequence of behavioural steps that comprise the behaviour episode from initial engagement in a setting until the successful satisfaction of the motive.	Place items on conveyor belt. Store basket neatly. Bag items after they are scanned. Pay cashier. Take bags.
People	All interdependent individuals who play some role in the successful completion of the behaviour episode.	Customer. Associates (e.g., partner, family members, friends). Cashier. Other supermarket staff.
Props	All "semi-fixed feature" objects that play some role in the successful completion of the behaviour episode.	Dividers, bags, digital interface, buttons, loyalty card.
Infrastructure	All "fixed-feature" architectural elements that play some role in the successful completion of the behaviour episode.	Checkout desk, computer systems, intercom, lighting, air conditioning.
Roles	The functionally distinct part(s) played by people, props, and infrastructure in supporting the behaviour episode.	People: Basket unloader, payer, grocery bagger, (customer). Props: Grocery advancer (conveyor belt). Infrastructure: Price calculator (computer system).
Competencies / Attributes	The features of props and infrastructure – and the competencies and characteristics of people – required to successfully fulfil their respective role(s).	People: Physically capable and dexterous, coordinated (customer) Props: clean, automatic advance (conveyor belt). Infrastructure: Accurate, fast, up to date (computer system).
Motives	That which motivates people to engage in the target behaviour.	Hunger, nurture, hoard.
Norms	The explicit or implicit social rules that govern and otherwise influence behaviour.	Wait in line. Load own groceries onto belt. Be polite. Pay amount shown. Bag own groceries.

Target behaviour

Early behaviour settings research (e.g., Barker, 1960) sought to explain human behaviour in terms of the context in which it was occurring. Settings were seen as presenting people with opportunities to satisfy a range of motives and, at the same time, obligations to behave in certain ways. In the adoption of behaviour settings theory for supporting behaviour change, as is the case with the present research, we take a further step in seeking to manipulate the setting in order to stimulate and support a desired behaviour (Aunger & Curtis, 2016). The *target behaviour* is the articulation of that desired behaviour. It should make clear what it is that the researcher or practitioner wants the protagonist to do.

Stage

Behaviour settings are *spatially bound* by the interdependent people, objects, and features of the milieu that contribute to the standing pattern of behaviour. Behaviour settings are also *temporally bound* by the duration of the behaviour episode. Behaviour settings do not, however, generally occur in complete isolation. They are nested within broader contexts (Barker, 1963). This broader context is referred to in the behaviour setting canvas as *the stage*. For example, checking out of a supermarket (the behaviour setting) is nested within the supermarket checkout area (the stage).

Routine

The *routine* in the behaviour setting canvas can be thought of as a breakdown of all relevant steps taken in completing the target behaviour. This is referred to by Barker (1963) as a "standing behaviour pattern". The routine is synonymous with the user- or customer-journey (Lemon & Verhoef, 2016) although, just as the behaviour setting is nested within the stage, a behaviour setting can also be thought of as being nested within an entire user journey. Continuing the example used above, checking out of a supermarket (which constitutes a discrete behaviour setting) is just one part of the entire grocery shopping user journey that might begin with the generation of a shopping list at home and extend to include returning home to place items in a person's cupboards and refrigerator.

People

As described in section 5.2.1, people contribute to behaviour settings as both "things" (acting independently to satisfy individual motives) and "medium" (acting interdependently to give form to a setting) (Barker, 1978). In line with the setting–stage distinction, the people section of the behaviour setting canvas should include a list of all individuals, generally summarised into distinct categories or roles, that, through their interdependence, contribute to the standing pattern of behaviour. In the supermarket checkout example, people will include the current customer and checkout operator but may also include other customers (e.g., behind in line or still packing their groceries), other shop staff (e.g., collecting forgotten items or checking prices) and potentially friends or family of the current customer (e.g., children, partner). In some instances, props or aspects of the infrastructure can have agentic qualities and adopt a role that might traditionally be played by a person. In the supermarket checkout setting for example, this is exemplified by a self-checkout system that enables a customer to complete their checkout without interacting with supermarket staff. The agent (i.e., the self-checkout terminal) interacts with the customer, updating the price as items are scanned, providing instructions (e.g., "Please place your item in the bagging area"), and guiding the customer through the payment procedure. As will be discussed below, such an agent has a specific role to play in the behaviour setting and must possess certain attributes that enable it to enact that role effectively.

Props

In the behaviour setting canvas, *props* refer to what were earlier described as "semi-fixed feature elements" in a setting (Fuhrer, 1990). That is, props are manipulable objects that contribute, through their interdependence in the setting, to the successful completion of the target behaviour. In the supermarket checkout example, props will include things such as supermarket trolleys and baskets, the spacers between subsequent shoppers' groceries, shopping bags, the checkout operator's chair, customer's wallets, bags and smartphones or other payment methods. There might also be digital props in the form of buttons manipulated on an interface.

Infrastructure

The *infrastructure* refers to what were earlier described as "fixed-feature elements" (Fuhrer, 1990). These are non-manipulable things that also contribute, through their interdependence in the setting, to the successful completion of the target behaviour. While infrastructure can of course be considered part of the stage, only features of the infrastructure that, through their interdependence in the setting, contribute to the successful completion of the target behaviour are included in the behaviour setting canvas. These may be physical features but may also include systems that support the functioning of the stage. In the supermarket checkout example, relevant elements of the infrastructure will include the checkout desk, the computer system that facilitates scanning of items, the intercom, and atmospheric elements such as lighting, air conditioning and the audio system. There may also be some digital parts of infrastructure such as a database that contains all items and associated prices. Note that in a self-service checkout setting, the automatic checkout machine assumes agentic qualities (i.e., communicates instructions to the current customer and reacts to the customer's actions). While technically considered part of the infrastructure, such things are more akin to people in the role they play in a setting.

Roles

Every person, prop and feature of the infrastructure plays one or more *roles* in supporting the behaviour episode. In any behaviour setting, it is possible that a person, prop, or feature of the infrastructure simultaneous plays multiple roles. It is therefore critical to identify and acknowledge only that or those roles that in some way contribute to the target behaviour. For example, at a supermarket, a person may be playing the roles of payer, item finder/gatherer, child carer, and grocery bagger among others. If the presence of the person's children does not contribute to (or hinder) the target behaviour, the role of child carer need not be considered. Similarly, if the role of a person, prop or feature of the infrastructure cannot be articulated, it is likely that that element should not be included in the behaviour setting. In the above case, the person's children would not need to be included as it is deemed they do not influence the outcome of the behaviour episode. Functions or 'jobs to be done' (Christensen et al., 2016) are other common terms that might be used for roles.

Competencies / Attributes

To successfully fulfil their respective role(s) within a behaviour setting, people (and agents) require role-specific *competencies* or *attributes*. And to fulfil their respective role(s), props and features of the infrastructure require role-specific *attributes* (Aunger & Curtis, 2016). The fulfilment of a particular role may require multiple competencies or attributes. Only those competencies or attributes that relate to the target behaviour are included. In the supermarket checkout example, the *role* of the conveyor belt is to move groceries along toward the cashier. The *attributes* of the belt, in fulfilling this role, might be that it is clean, wide, and long enough to hold a trolley/basket load of groceries, that it moves automatically as the cashier takes items, and that it stops automatically as items arrive at the cashier.

Motives

Central to behaviour settings theory is that behaviour is directed toward the fulfilment of one or more motives. A characteristic feature of behaviour settings is what Barker (1960, p. 5) describes as "great diversity of personal motivation yet behavioural uniformity". For example, sticking to our supermarket setting, different people may be motivated by very different things (e.g., satisfy hunger by buying lunch to consume immediately; nurture a family by doing the weekly shop; or gain status by purchasing a box of donuts for the office), yet all three people's behaviour, as moderated by the behaviour setting, is very similar as each of these motives can adopt similar roles within the setting. Everyone finds their items, stands in line, greets the cashier, pays, bags their items and so on. Aunger and Curtis (2013) identify 15 distinct motives, organised into three types and that satisfy eight unique needs (see the table on pages 53-54 of their article for a summary of these motives). This list of motives has been used widely (and usefully) within the Behaviour Centred Design context that leverages behaviour settings but other lists of motives may also be useful (e.g., Self-Determination Theory, R. M. Ryan & Deci, 2000). As with the other elements of the behaviour setting canvas, only motives that influence the target behaviour are included in the canvas.

Norms

People's behaviour in settings is influenced by powerful social *norms*. These norms help to explain uniformity of behaviour despite diversity of motivations as described above. Norms are implicit or informal rules that tell people the behaviour expected of them as they move from setting to setting. Norms can be categorised as injunctive or descriptive (Cialdini et al., 1991). *Injunctive norms* are those that a setting generally dictates. All people are expected to adhere to injunctive norms and lack of adherence is met with strong disapproval. *Descriptive norms* are those that people are seen to exhibit. In the supermarket checkout example, waiting your turn and paying the amount shown would be considered injunctive norms. A descriptive norm could be people leaving unwanted items in the shopping basket at the start of the conveyor belt. Although norms are generally thought of as applying to people, they can also relate to props and features of the infrastructure. Such norms tell people how a prop or feature of the infrastructure is expected to behave. In the supermarket checkout example, people expect the conveyor belt to move as soon as the section of belt next to the cashier is empty, hence people begin placing their groceries on the far end of the belt rather than placing them close to the cashier.

5.3. Settings, analysis, and key insights

The research presented in this chapter comprised the analysis of four distinct behaviour settings, summarised in Table 12. Of the four settings, three (i.e., S1, S2, and S3) are set within the broader context of two multidisciplinary business conferences (BC1 and BC2). The fourth (S4) is set in an experimental 'smart' workplace within the headquarters of a multinational organisation. Business conferences and experimental workplaces are both considered organisational settings where connections to others are critically important. Settings (S) and data collection methods are summarised in Table 12 and each setting is explained in detail below.

Table 12: Summary of settings and methods

(S)	Description	Data collection
S1	Braindate (BD) – Technology facilitated connecting at a business conference (BC1).	Half day of observation. Researcher immersion/participation. 5 interviews
S2	Outdoor Networking (ON) – Networking in an outdoor social area at the same business conference (BC1).	Full day of observation. Researcher immersion/participation. 7 interviews
S3	Ball pit Networking (BN) – Networking around a ball pit at the second business conference (BC2).	Half day of observation. Researcher immersion/participation. 5 interviews
S4	Workplace Connecting (WC) – Connecting in the social space (i.e., kitchen, lounge and meeting area) in an experimental 'smart' workplace.	Four days of observation. Researcher immersion. 20 interviews

5.3.1. S1 – Braindate (BD)

Braindates are topic-led, time-constrained, conversational interactions between conference participants coordinated through a mobile application. Braindates consist of 30-minute conversations about topics suggested by participants and are intended to take place in a designated area of a conference – the Braindates Lounge (BL). The spatio-temporal boundaries of braindates are established by the pre-set duration of conversations and the creation of a purpose-built area allocated to participants (Figure 13). Data collection involved 4 hours of observation of different parts of the braindate experience. I also registered for the experience and participated in three braindates as a host and three as a guest. Finally, I conducted semi-structured interviews with five participants. The behaviour setting canvas provided structure for the organisation and analysis of the data. This analysis, which follows the canvas's structure, is presented below.

Figure 13: The Braindate Lounge

Target behaviour

The target behaviour of the BD is to engage in a successful interaction with a stranger (braindate partner).

Routine

The complete braindate journey begins when participants register on the braindate app as part of the conference registration process. Having registered for the conference and created their braindate profile, participants post topics they would like to discuss in braindates. These topics appear in what is referred to as the "braindates market" which is a directory of all topics. Topics are essentially headlines or conversation starters that provide others with an indication of a person's expertise or areas of interest. Participants also use the scheduling function in the app to indicate when they are available to meet. Participants visit the braindates market and search or scroll to find topics that sound interesting to them. Once a topic is found, a participant will request a braindate with the person who posted the topic and suggest up to three time slots when their own availability aligns with that of the topic owner. The topic owner confirms the request and the braindate is scheduled. The routine relevant to this BD setting begins ten minutes prior to the scheduled start of the braindate when participants receive a notification to proceed to the BL to meet their braindate partner. In a typical routine, one braindate partner finds their allocated meeting place and waits for the other to arrive. Once partners have found each other they together decide on where to sit within the BL. They complete their 30-minute

interaction, unscripted aside from the original topic offered on the braindate market. Once completed, people move onto their next activity (e.g., attend a conference session or participate in another braindate). At this point, the behaviour episode (i.e., the routine) concludes.

People

Several people may be involved in the braindate setting. Below is a list of relevant people. Each bullet includes the title of the person in bold, followed by a description of their primary role. Each sub-bullet specifies a competency required to fulfil the role:

- **Braindate host** – the person who posts the braindate topic on the marketplace. The competencies required to fulfil this role include:
    - Tech-savviness to be able register on the platform and respond to requests to connect.
    - Confidence in the topic they wished to share/discuss, thus implying a degree of relevant experience.
    - Sociability and willingness to converse with prospective guests.
- **Braindate guest** – the person who responds to the braindate topic posted by the host. Required competencies include:
    - A degree of tech-savviness to be able register on the platform and initiate requests to connect.
    - Sociability and willingness to converse with hosts about the topics posted.
- **Other braindaters** – other participants (hosts and guests) in the braindates lounge. Though not explicit, in the context of this setting, roles of other braindaters were to demonstrate target behaviour (i.e., that hosts and guests could emulate), and to create critical mass, providing hosts and guests with confidence that this was a worthwhile (i.e., popular) use of their time. Main competence required:
    - Ability to effectively navigate the experience.

- **Braindate staff** – employed staff facilitating the braindate experience. The primary role of staff was to provide assistance (e.g., explain how braindates work and answer questions). Required competencies:
  - Tech-savviness to navigate the platform and product knowledge.
  - Approachability and personable character, to help participants feel at ease.
- **Conference staff** – employed by the conference organiser. The roles fulfilled by staff included creating the right atmosphere (e.g., lighting, temperature) and keeping the BL maintained (e.g., cleaning). These were not explicitly related to the experience but were necessary nonetheless. Required competency:
  - The ability to fulfil their diverse respective role(s).
- **Other conference attendees** – that is, those attending the conference but not directly engaged in braindate activities. These people added to the bustle of the conference atmosphere and provided an audience for braindaters.

Stage, Infrastructure and Props

The *stage* of S1 was a purpose-built area (the "Braindates Lounge") situated within a large (approximately 3,000 person) business conference held in an industrial warehouse space (i.e., cavernous space, concrete floor, exposed steel beams, few windows). It was a bustling space with many areas outside of the BL such as theatres, meeting areas, food vendors and live entertainment.

Elements of the *infrastructure* relevant to this setting (S1) as well as related roles and attributes were:

- A **custom built tiered-seating structure** with stairs up one side and a large flat floor surface at the uppermost level. The key roles of this structure were to create a dedicated BD area, isolated from the rest of the conference, and provide participants with somewhere to sit. Stairs provided a means to ascend and descend the different tiers of the structure.
  Attributes were functional as well as aesthetic. Each tier was approximately 500mm high, 750mm deep, and varied in width to accommodate three or four

seated braindate pairs (see Figure 13). The structure had a raw/natural aesthetic.

- **Electrical infrastructure** (i.e., power outlets) was built into the seating structure. The role of this element was to provide participants with charging points for electronic devices. There were four or five power outlets per tier. Required attributes of the outlets were that they needed to be conveniently located and compatible with the plugs of participants' devices. The overall system needed to have sufficient capacity so as not to be overloaded if all outlets were used simultaneously.

- **Wifi** was available to all conference participants. The role of the wifi was to provide participants with a means of accessing the internet to be able to access the braindates application. The required attributes of the wifi were that it was functioning and provided suitable bandwidth for all participants.

- The digital infrastructure comprised the **braindates app** which integrated seamlessly with the conference app. Within the boundaries of the current behaviour setting, the role the app played was to direct hosts and guests to the meeting point and provide a messaging tool to support them in finding each other. The app had to be functional and intuitive for participants.

Numerous *props* were included in this setting and could be categorised as 'BD-related' and 'personal'. These props as well as their roles and attributes were:

BD-related props:

- **Meeting points signs** whose role it was to facilitate braindate participants in finding each other. There were six signs, each with a simple graphical icon (e.g., ice cream, donut, balloon). Signs needed to be clearly visible, recognisable to an international audience, and sufficiently distinct so that none could be mistaken for others.

- **Various forms of seating** including small cube seats in the meeting area, cushions on the tiered structure, and café-style seats on the upper floor level where group braindates were located. The role of seats was to provide participants with somewhere to sit while waiting for their braindate or while participating in the braindate. Seats also indicated where it was intended that people seat, thus normalising distancing between braindate pairs. As well as

needing to be available, seating had to be sufficiently comfortable to support seating for the duration of a braindate.

Personal props:

- **Smartphones** were essential for scheduling and confirming braindates as well as messaging. Smartphones needed to be functioning and sufficiently charged.

- **Smart name badges** played an important role in helping to identify people. The 'smart' element of the name badges was the use of Bluetooth technology to enable participants to exchange contact details by holding their badges close to each other and pressing a button. When details had been exchanged, the button on the badge would glow. Name badges needed to be visible and legible, and the smart technology needed to function correctly.

- **Clothing items** assumed multiple roles. Clothing was often used by participants to identify each other (e.g., "I'm wearing a red jacket and white shoes"). A more subtle role of clothing was to indicate a person's role or industry (i.e., creative participants were generally dressed more casually, and corporate participants were generally dressed more formally).

- **Bags / handbags and their contents** performed two main roles. They contained personal possessions (e.g., notebooks, water bottle, devices) and, like clothing, were used as unique identifiers (e.g., "I have a green backpack").

- **Other electronic devices** (e.g., tablets, laptops) were used by some participants to access the braindate platform. Like smartphones, these other devices needed to be functioning and sufficiently charged. If not charged, participants also required the requisite cables to plug them in.

Motives

Interviews with participants revealed four primary motives that motivated them to participate in braindates, namely curiosity, affiliate, play, and status.

- **Curiosity** – that is, the collection of (new) knowledge – was the primary motive that drove people to participate in braindates. One participant referred to the conference as a "watering hole" where so many different people came to meet. Participants saw the braindate experience as an opportunity to gain new knowledge that they would ordinarily not have ready access to.

- **Affiliate** – that is, collaborative activities such as sharing knowledge – was important for all participants interviewed. Where curiosity motivated some to seek out others from different disciplines, there was an overwhelming desire to find or create collaborative opportunities with others.
- **Play** – that is, acquiring skills and competencies through repeated practice – was also mentioned by some participants, particularly hosts who had posted conversation topics to which others had responded. Because it was possible for multiple guests to respond to the topic of one host, it was feasible that a host could have multiple conversations about their topic with different people over the course of the conference.
- **Status** – that is, improving a person's rank or social position – was mentioned by one participant who deliberately sought others of higher rank (e.g., "successful creatives to help advance my career").

Norms

The Braindates concept was new to most people so while many norms were common to all networking-type settings, some functional norms had to be learned. As described earlier, norms could be categorised as injunctive and descriptive. Relevant norms in this setting were:

- Injunctive norms
    - Be honest on the app (i.e., share actual information).
    - Show up on time.
    - Sit at your assigned meeting point (i.e., next to the correct sign).
    - Use the braindates lounge for your braindate.
    - Leave the braindates lounge when your braindate ends.
- Descriptive norms
    - Some participants fail to show up.
    - Participants use the messaging function in the app to arrange alternate meeting points (i.e., not in the braindates lounge).
    - Participants do meet in the general meeting area but not always next to the assigned sign, making them more difficult to locate.

- Participants meet in the braindates lounge meeting area but find somewhere else to sit for their actual braindate.
- Participants (usually just one of the pair) stay in the braindates lounge after the braindate ends.
- Non-braindaters sit in the braindates lounge to make use of the power sockets.

Summary and key insights

The BD setting generally supported the target behaviour and, consistent with behaviour settings theory, the behaviour of participants was mostly predictable throughout the behaviour episode. Our detailed analysis of this setting, supported by the structure of the behaviour setting canvas, revealed both strengths (+) and weaknesses (–) of the experience. These are summarised here and discussed in more detail in the discussion at the end of this chapter.

- **Structured routine clearly communicated (+):** The clear communication regarding how the experience worked and the design of the app which led people through a series of consecutive steps ensured that the routine was followed consistently despite most people having no prior experience.

- **Setting incompatibility (–):** Deviations were observed in the interpretation of steps rather than in their order. For example, many participants chose to conduct their braindate somewhere other than the BL. They would either use the app to find someone with whom to connect and message that person to suggest another meeting point, or they would use the meeting point in the braindates lounge and then leave to sit and talk somewhere else. This was explained by participants in several ways. One participant, for example, mentioned how there was not sufficient privacy in the braindates lounge. People sitting above others, due to the tiered nature of the structure, left some feeling that others were "looking over their shoulder". Three other explanations provided by participants were: the tiered seats were uncomfortable; seats were difficult to get to ("you have to squeeze along behind others who are already seated"); or participants wanted to combine

their conversation with getting a drink so they went to a bar elsewhere on the conference site.

- **Incentive to linger and non-participant attraction (–):** The power outlets in the seating structure had unintended negative consequences in this behaviour setting. Power outlets afforded the possibility to charge electronic devices, thus encouraging some participants to linger beyond the conclusion of their allotted 30-minute braindate. The power sockets also had the effect of attracting people to use the braindates lounge even when not engaged in braindates. This deprived braindaters of places to sit (see the man in the white shirt in the centre of Figure 13 for example).

5.3.2. S2 - Outdoor networking

Outdoor networking (ON) was the second behaviour setting studied at BC1. Unlike the braindates setting which was designed for specific semi-facilitated HC interactions, the ON setting was broadly designed to simply afford HC interaction. Roles and norms guiding behaviour were more flexible and so too were the routines followed by participants. The target behaviour in such a setting could vary from connecting with a business collaborator to finding a date, particularly in the evening when the general mood shifted from professional to social. Although at times difficult to distinguish, our general focus with this research was on the establishment of professional (e.g., business collaboration) connections rather than personal (e.g., romantic date) ones.

Situated just outside the main entrance to the conference building, the outdoor networking area was intended as a place for conference participants to gather and socialise. Due to the unstructured nature of this setting, the corresponding behaviour episode was somewhat variable, influenced by the type and subsequent duration of each encounter. Data collection involved 6 hours of observation spread over different times of day during the conference. I also spent approximately four hours immersed in the setting, participating in social activities including networking. Separate to the social conversations that occurred during this immersion, I conducted semi-structured interviews with seven participants which varied in duration from 20 – 30 minutes.

Again, the behaviour setting canvas provided structure for the organisation and analysis of the data presented below.

Target behaviour

The target behaviour in the ON setting was to engage in a successful interaction with a stranger (i.e., other conference attendee).

Routine

The diversity of people and their respective schedules, cultural perspectives, motives and so on meant that the temporal nature of the routine and its nuanced detail varied greatly. Some people would visit the outdoor networking area for less than an hour while others would stay for the entire afternoon. The dominant behaviour setting however centred around a meal or drink experience. Our focus was on participants who would (attempt to) connect while enjoying food or drink. All encounters followed a comparable routine that could be deconstructed into four steps, namely: identify, situate, interact, separate. First, participants would identify someone to interact with. This was mostly achieved serendipitously (e.g., standing next to someone at the bar or waiting in line at one of the various food trucks and deciding to interact) but could also be achieved through the other tactics presented in the previous chapter. For example, some participants recognised and approached someone they had seen during a conference speech or workshop (sought) or they were introduced by someone else (suggested). Having found someone to connect to, the next step was finding somewhere to sit from the various seating and table options provided. On some occasions, steps 1 and 2 were reversed, for example if someone already had a seat and they started chatting to someone else on the same table or someone else joined them at their table. Once seated, participants would engage in conversation, the duration of which varied from approximately 15 – 90 minutes. And finally, at a certain point people would separate and move on to another conference activity.

People

Like in the BD setting, various people were involved in the ON setting. As with the previous setting, each bullet below includes the title of the person in bold, followed by a description of their primary role. Each sub-bullet specifies a competency required to fulfil the role.

- **Connector** – the person initiating the connection. The competencies required to fulfil this role include:
    - Sufficient social confidence to initiate a connection with a stranger.
    - Conversational ability (e.g., listen well and ask relevant questions).
- **Contact** – the target of the Connector's attention who responds to the invitation to connect. Required competencies include:
    - Sufficient social confidence to feel they could successfully engage in a connection with a stranger.
    - Conversational ability (e.g., listen well and ask relevant questions). Note: in the case of serendipitous connections, both people in a dyad play the role of Connector and Contact simultaneously although there is still generally one person who, albeit subtle, makes the first move.
- **Introducer** – A third person (i.e., not part of the connecting dyad) who may introduce the dyad to each other. The introducer was not present in every ON setting but when they were present, they played an important role. This person may have known one or both of the dyad in advance (e.g., a mutual friend, colleague, or acquaintance) or may have only just met them within the ON setting. Required competencies include:
    - Social perception to read the situation and believe that the dyad would benefit from being introduced to each other.
    - Sociability or a willingness and ability to engage with the dyad and make the introduction.
    - Sufficient level of knowledge regarding the dyad or generally sufficient social aptitude to offer a conversation starter.
- **Other conference attendees** – those people participating in the conference but not part of the connecting dyad. Many other conference attendees comprised other connecting dyads while others were not engaged in

connecting. As such, these people fulfilled a range of roles including populating the setting (e.g., taking up space at tables and in queues and creating a general sense of buzz), demonstrating expected behaviours, and providing a sense of social accountability.

- **Conference staff** – people working for the conference organisers in a paid or volunteer capacity and fulfilling a variety of roles from security to cleaning to providing general information (e.g., wayfinding). The competencies of these people corresponded to their specific roles, for example:
    - Security staff required relevant authority and skills to ensure only paid conference attendees would have access to the space, thus ensuring the legitimacy of Connectors and Contacts.
    - Cleaning staff needed to be observant and efficient, to identify tables that needed clearing and clear them efficiently, to free up space for other guests.
- **Food/drink stand staff** - prepared and served food from the various outlets (mostly food trucks) surrounding the outdoor networking area. The required competencies of these people were:
    - Client handling and food preparation skills to prepare and serve food as quickly as possible, to maximise interaction time for people connecting.
    - Sociability to engage in conversation with customers, potentially to stimulate interaction between people waiting for food.

Stage, Infrastructure, Props

The *stage* of S2 was the outdoor area of a business conference set on a large industrial site (concrete, steel structure, corrugated steel, and brick cladding). The contribution of this stage to the behaviour setting was that it created a relaxed atmosphere, noticeably less formal than a typical conference venue (e.g., hotel or purpose-built conference facility).

Being an outdoor space, the *infrastructure* was relatively limited. Elements of the infrastructure that contributed to this behaviour setting, including roles and attributes, were:

- Rough **concrete floor/ground surface**. The role of this surface was to provide a general foundation for the entire ON setting. Its open and exposed character contributed to the raw and relaxed aesthetic of the setting.

- Raised **wooden terrace structure(s)** built on top of the concrete slabs over part of the outdoor networking area. The role of these structures was to provide a natural alternative to the concrete floor and to give participants who use them a different (i.e., elevated) perspective.

- **Wooden tree planters** with an assortment of trees added some nature to the barren industrial space and in some cases provided a sense of privacy.

- **Sound and lighting installation** enabled the playing of music throughout the experience and using lighting to add atmosphere to the setting, particularly in the evening.

- A **central bar** and perimeter of **temporary food installations** (e.g., food trucks and pop-up restaurants) provided sustenance to participants.

Like in S1, in this setting numerous *props* were identified and these could again be categorised as 'ON-related' or 'personal related'. These props as well as their roles and attributes were:

ON-related props:

- **Tables and chairs** provided participants with somewhere to sit and eat/drink or work. The two main designs were picnic tables (A) and standing tables (B) (see Figure 14). The picnic tables were standard wooden design with a central table surface and a full-width bench seat along each side. The bench seat on each side could accommodate three people (or four if seated very close). Each standing table was provided with between two and four bar-stool height chairs that participants could move about.

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Figure 14: Furniture and general layout and aesthetic of the outdoor networking area

- **Parasols** were mounted into a selection of the picnic tables to provide shade for participants sitting at those tables. The conference took place in early summer and the days were very bright and hot. The parasols needed to be large enough to provide shade for everyone at a table.

- **Rubbish bins** were dotted around the area to encourage participants to dispose of their own rubbish (e.g., food containers or wrappings and food waste). The rubbish bins needed to be sufficient in number to collect all rubbish participants wanted to dispose of and sufficiently visible and available that no effort was required of participants in locating them.

- **Tensa-barriers** were used outside most food outlets to manage the lines of people waiting to be served, especially during the busy lunch period. These tensa-barriers had to be long enough to accommodate the number of customers at each food outlet.

Personal props:

- **Smart name badges** played an important role in communicating participants' names and company names. As explained in S1, the 'smart' element of the name badges enabled participants to exchange contact details by holding their

badges close to each other and pressing a button. Name badges needed to be visible and legible, and the smart technology needed to function correctly.

- **Clothing items** assumed multiple roles. As well as providing general comfort (e.g., warmth or sun protection), clothing was often used by participants to indicate a person's role or industry (i.e., creative participants were generally dressed more casually, and corporate participants were generally dressed more formally). Jackets were often used to save seats for others.
- **Bags / handbags and their contents** performed two main roles. They contained personal possessions (e.g., notebooks, water bottle, devices) and, like jackets, were sometimes used to save seats at tables.

Motives

Interviews with participants revealed their two primary ***motives*** for networking in this area were curiosity and affiliate. These and other secondary motives are explained below.

- **Curiosity** – was the primary motive that drove people to connect to strangers in the ON setting. While some participants mentioned being targeted in their approach (e.g., deliberately looking at name badges for people who worked for companies they recognised or that sounded interesting), many were happy to just start up random conversations "and see where it takes me".
- **Affiliate** – was important for all participants interviewed. Much like responses from participants in the BD setting, where curiosity motivated some to seek out others from different disciplines, there was an overwhelming desire to find others to collaborate with. In addition, participants also mentioned enjoying the "buzz" of the outdoor networking area and feeling part of a bigger group.
- **Play** – was a motivating factor for some participants although not as strongly as in the BD setting. For most people, striking up a conversation with a stranger is challenging as it feels socially risky with a perceived high chance of rejection. In such a conference setting, purposefully designed to feel relaxed and informal, this perceived risk was reduced. Participants mentioned a sense that they were "able to speak to just about anyone".

- **Hoard** – that is, the accumulation of resources – was another secondary motive that surfaced through interviews. The density of participants in the outdoor networking area made it easy for people to bump into many other conference attendees in a short space of time. This density, combined with the way smart name badges facilitated the exchange of personal details, made it possible to meet many people and gather their information quickly and effortlessly even if, on reflection, a person had no reason to reach out to a new contact again.
- **Attract/Lust** – that is, the pursuit of appropriate candidates for sexual relations, also appeared to be motivating some participants. Although such pursuits were considered to fall outside the target behaviour, this insight points to the blurry line between personal and professional connections in organisational contexts as highlighted in earlier chapters.

Norms

The *norms* that guided behaviour in the ON setting were mostly familiar to those one would expect in any traditional business networking context. That said, the informal outdoor setting, the diversity of participants, and the self-serve nature of the food and beverage offerings created a degree of ambiguity with regard to normalised behaviour. Relevant norms are listed below, again categorised as injunctive and descriptive:

- Injunctive norms:
  - Follow standard business networking behaviour – i.e., introduce yourself, listen and respond to questions, introduce other people you are with, share contact details on request.
  - Share the communal space with others – i.e., do not take up more space on a table than you need; allow others to sit with you at a shared table.
  - Don't use a seat/table longer than you need to, to free up space for others.
  - Clear up your space when you leave.
  - Sit in the designated seating areas.

- Descriptive norms:
  - People did not always take away their rubbish or empty glasses/bottles with them.
  - People spread out at tables, taking up more space than they needed.
  - Bags and coats were often placed on seats or tables rather than on the floor and out of the way.
  - People sat along the edges of the wooden terraced areas.

Summary and key insights

The ON setting was somewhat effective in supporting the networking behaviour episode and helping participants to achieve their objective of successfully engaging with a stranger. As was observed in S1, behaviour of participants in this setting was mostly predictable. Variation was likely explained by the complexity of the context compounded by diversity of participants and their motives. Our detailed analysis of this setting again revealed a number of strengths (+) and weaknesses (−) of the setting which made achieving the connectivity objective more or less challenging. These insights are summarised below and expanded on in this chapter's discussion.

- **Setting complexity (−):** The flexible nature of the location meant that it played host to multiple behaviour settings simultaneously. Participants were constantly transitioning between settings and roles.
- **Compromise of features (+/−):** The industrial outdoor context with rough concrete floor created an informal setting that appeared to help people relax and connect more comfortably. However, this floor surface was perceived as dirty which encouraged people to place their bags, coats, and other personal items on the table in front of them or the seat beside them. This had the effect of reserving spaces even when this was not the person's intention.
- **Capacity (−):** There was insufficient seating for the number of attendees leading to some attendees sitting along the raised edge of the wooden terraced floor sections, thus blocking access for others. Several participants were also observed hovering (i.e., waiting on the fringes for seats to become available, very conscious of others doing the same). This created unnecessary tension. During lunch times the area became very busy. Participants spent a lot of time

waiting in lines or for tables. Pairs of participants who had just met (e.g., while waiting in line at the same food truck) were observed walking around for some time looking for somewhere to sit. Some eventually gave up and went back indoors in search of space.

- **Accessibility – physical and dietary (–):** Seating at the picnic tables proved problematic for some people (e.g., those dressed in tight trousers or short skirts or generally less physically able). Bench seats required a person to lift up one or both legs to step over them in order to sit down. In addition, the available food options were typically heavy (e.g., hotdogs, crab rolls, burgers) which alienated some people (e.g., there were no salad options). Having spent (i.e., wasted) time walking around the outdoor space, people seeking lighter/healthier food would often return inside.

- **'Introducer' support (+):** One of the most effective ways to initiate connections was for a person to introduce two others. It could be that the introducer knew one of the others in advance, or they may have just met (e.g., two recent strangers in conversation at a table when another stranger joins them looking for somewhere to sit).

- **Atmospheric (weather) conditions (+/–):** It was very sunny for much of the conference. This had a positive effect of encouraging people outside into the space and providing a comfortable temperature in which to interact. However, due to the nature of picnic tables, this often meant one side of the table was looking directly into the sun while the other side had their backs to the sun. The bright sun also reflected off the surface of the aluminium tables and it affected the utility of the smart badges as the faint confirmation light on the badges (i.e., the light that illuminated when a match was confirmed) was almost impossible to see. In addition, there were insufficient parasols for all tables. Those people who were lucky to be sat at a table with a parasol tended to huddle closer together to take advantage of shade. This had the unintended consequence of facilitating connectivity.

5.3.3. S3 – Ball pit networking

The ball pit networking setting (BN) was studied at a technology and marketing focused business conference in Austria (BC2). The BN setting was located around and in a stand-alone structure (a ball pit) placed in what conference organisers referred to as the "Connect Sessions" zone of the conference (Figure 15). The ball pit was intended as a fun activity that would provide conference attendees with a place to sit and connect. Much like the ON setting above, the BN setting was intended to encourage unfacilitated spontaneous connecting. The way participants engaged with this setting and the duration of the behaviour episode were variable, ranging from approximately 15 – 45 minutes. Data were collected by means of 5 hours of observation and five semi-structured interviews. Observations were divided between morning (2 hours), early afternoon (2 hours), and end of day (1 hour) sessions. Interviews varied in duration between 15 – 30 minutes. I also spent 2 hours immersed in the setting, actively participating in networking activities. The behaviour setting canvas was used to structure the collection and analysis of data which is presented below.

Figure 15: S3 – Ball pit at business conference (BC2)

Target behaviour

The target behaviour in the BN setting was to engage in a successful interaction with a stranger (i.e., other conference attendee).

Routine

As described above, the temporal nature of the routine varied. Participants were not guided regarding how the ball pit should be used. That said, most encounters followed a comparable routine that, like in the ON setting, could be deconstructed into four steps, namely: identify, situate, interact, separate. Like the ON setting, the

routine was somewhat flexible, particularly with regard to the first and second steps. That is, rather than find someone to connect with (i.e., identify) before finding somewhere to sit (i.e., situate), the reverse could occur. A person could already be sat next to a stranger before engaging with them. A typical routine began with participants identifying someone to interact with. This was mostly achieved serendipitously (e.g., just happening to arrive at the ball pit at the same time) but could also be achieved through sought, suggested, or seduced tactics. For example, a participant recognised and approached someone from a conference speech or workshop (sought), they were introduced by someone else at the ball pit (suggested), or they performed an entertaining action in the ball pit that caused someone to stop and engage with them (seduced). Having found someone to interact with, the next step was deciding where to situate themselves. Options were limited to standing next to the ball pit, sitting on the edge of the ball pit, or sitting in the ball pit. Once situated, participants would engage in conversation, the duration of which varied from approximately 15 – 45 minutes. Having completed their encounter, people would separate and move on to another conference activity, alone or together.

People

The people involved in the BN setting were limited to conference attendees and staff, further subdivided below. The roles and attributes of these people are in some cases identical to the previous (ON) setting. As such, just the titles and roles are provided below. Associated attributes may be found above.

- **Connector** – the person initiating the connection.
- **Contact** – the target of the Connector's attention who responds to the invitation to connect.
  Note: in the case of serendipitous connections, both people in a dyad play the role of Connector and Contact simultaneously although there is still generally one person who, albeit subtle, makes the first move.
- **Introducer** – a person who (only in some cases) introduces connector and contact to each other.
- **Other conference attendees** – those people within the BN setting, potentially connecting to others, but not part of the connecting dyad.

Note that all people who fully participated in the BN setting (i.e., climbed onto and/or into the ball pit) required a degree of physical strength and dexterity in order to ascend the ball pit structure. This applied to Connectors, Contacts, Introducers, and other conference attendees.

- **Conference staff** – people working for the conference organisers in a paid or volunteer capacity and fulfilling a variety of roles from security to cleaning to providing general information (e.g., wayfinding).

Stage, Infrastructure, Props

The *stage* of S3 was the "Connect Sessions" zone within a large purpose-built conference centre. This zone comprised the ball pit, standing tables, and decorative furniture. The conference centre had very high ceilings and concrete floors. Boundaries of the BN setting were indicated by the borders of a carpeted area.

The *infrastructure* comprised multiple elements. The main element was a custom-made ball pit that was approximately 5 metres square with sides 1 metre high. The ball pit was constructed with wooden EUR/EPAL-pallets stacked six-high, creating a large flat surface around the circumference. The upper and inner surfaces of the pallet structure were covered with a natural-coloured sacking cloth stapled to the wood. The inner space was filled, almost to the top, with thousands of semi-hard white balls measuring approximately 80mm in diameter. The primary role of the ball pit was to provide a unique and fun place for people to interact. The upper surface surrounding the ball pit provided seating opportunities as well as somewhere for people to store personal belongings and place drinks. The ball pit needed to be sufficiently enticing to attract people to it, large enough to accommodate potential users, and physically navigable for participants to enter and exit it.

In addition to the ball pit, the infrastructure also consisted of:

- **Communication signage** - Hanging high above the ball pit was a large sign (approximately 2 x 2m) which read "CONNECT SESSIONS". The role of this sign was to attract participants from a distance.

- **Instructional signage** - Attached to all sides of the ball pit were warning signs. These signs read: "Benutzung auf eigene gefahr" which translates as "Use at your own risk". The role of these signs was to warn users that there

was some potential risk and, more likely, to reduce the organiser's potential liability was someone to injure themselves. These signs were printed in white, bold, uppercase lettering on black A3 card. The signs needed to be visible, legible, and understandable.

- **Gallery walls** - two wall-like structures, also constructed of pallets, were designed as small galleries from which a variety of pictures hung. The gallery walls needed to be attractive to help attract participants, and solid to suggest a boundary.

- Adjacent to the ball pit were **exhibition stands** from which vendors promoted their goods or services. These stands had two main roles. Firstly, they attracted people to the general area, thus facilitating discovery of the ball pit. Secondly, they created a barrier which guided foot traffic past the ball pit. As such, the exhibition stands needed to be sufficiently appealing and provide a boundary that participants would respect.

Like in the previous settings, numerous *props* were identified, and these could be categorised as 'ball pit-related' or 'personal related'. These props as well as their roles and attributes were:

Ball pit-related props:

- Several thousand **balls** filled the ball pit. The role of the balls was to give volume to the inside of the ball pit, thus supporting people who sat in it. The balls were also used in playful ways such as tossing at a person to get their attention. The balls needed to be strong enough to support the weight of people in the ball pit but light and soft enough that they would not cause injury to ball pit users.

- **Cushions** were strewn around the upper surface of the ball pit to make sitting on the hard wooden surface more comfortable. Cushions needed to be sufficiently thick to provide padding and not too large as to be too cumbersome to move.

- Six round **standing tables** were positioned next to the ball pit. The role of these tables was unclear. Perhaps they were intended to offer less adventurous

people somewhere to stand and talk. These were simple lightweight tables which could be moved easily by attendees.

- **Conversation starter cards** were strewn around the upper surface of the ball pit. The role of these cards was to support people in starting conversations and provide interesting questions to take conversations in less conventional directions. The cards included questions such as: "What has made you leave your comfort zone recently?", and "Being able to fly or breathe underwater: what would you choose?" The cards needed to be appealing, such that a person would pick one up; relevant, such that it would be clear what they were intended for; legible, such that the text could be read; and comprehendible, such that the text could be understood.

- Two **rubbish bins** were provided for participants to deposit their rubbish in. These were large buckets lined with black rubbish bags. Each morning, one bin was positioned on each side of the ball pit but were easily moved by participants. The bins needed to be visible and have sufficient capacity.

Personal props:

- **Name badges** played an important role in identifying a person and the organisation to which they belonged. Name badges needed to be visible and legible.

- Many people had **personal bags** which they used to carry their personal items. Bags were often used to save spaces and to indicate the boundary of a person's space. Personal bags needed to be uniquely identifiable and large enough to be seen as a barrier.

- Many people brought **drinks** with them into the BN setting. In the morning, these were mostly hot drinks (e.g., coffee, tea) and water. Later in the day most drinks were alcoholic in nature (e.g., bottled beer). The nature of the drinks reflected their role. Hot drinks are more associated with waking up and starting the day and alcoholic drinks are more associated with relaxing and socialising. Drinks needed to have sufficient volume to maintain a person's hydration while engaged in the behaviour setting.

- Most people also had **smartphones** with them. As well as being used to look up the conference schedule and share details between people, the unique

nature of this setting also resulted in most people also taking photos to capture the moment. Smartphones needed to be charged and offer the desired functionality.

- Participants' **shoes** also served as important props in this setting. Although there was no signage to suggest this behaviour, many people naturally removed their shoes before climbing into the ball pit. Shoes left outside the ball pit signalled expected behaviour to others. Shoes needed to be sufficiently easy to remove and put on such that having to do so would not deter a person from entering the BN setting.

Motives

Interviews with participants revealed the motives in this setting to be similar to those identified in the previous (S2) setting. Namely, the two primary *motives* for participants to engage in networking in the BN were curiosity and affiliate. These and other secondary motives are explained below.

- **Curiosity** – was the primary motive that drove people to connect to strangers in the BN setting. In this context, curiosity relates to having the latest information about marketplace trends and gathering new insights from a diverse potential contact pool. Unlike the ON setting (S2) in which some participants were targeted in their approach (e.g., using name badges to select target contacts), in this setting no participant mentioned being deliberate in their approach and would rather just see who they bumped into.

- **Affiliate** – was again mentioned or implied as important for all participants interviewed. As well as wanting to feel part of the broader audience of participants at the conference, it appeared that the BN setting attracted a certain type of person (i.e., open-minded and playful), and these people were excited to meet each other.

- **Play** – was a motivating factor for some participants. This motive relates to the act of talking to strangers, not of playing in a ball pit. As with the ON setting, participants commented on how striking up a conversation with a stranger is challenging as it feels socially risky with a perceived high chance of rejection. In a setting such as the BN, perceived risk was reduced as participants assume

that everyone else is there to have fun, so conversations are less formal and stressful.

- **Lust** – was observed to be motivating the behaviour of some participants although only later in the day when many were consuming alcohol. Some male participants became more flirtatious toward female participants, even beginning to show off (e.g., jumping into the ball pit or "splashing" their female partners with balls). This again points to the blurry line between personal and professional connections in organisational contexts as highlighted in earlier chapters.

Norms

Although the BN setting was unique for most participants (i.e., most had not been in a ball pit since they were children), several norms were clearly guiding their behaviour, both as it related to using the ball pit and as it related to networking with others. Relevant norms are listed below, again categorised as injunctive and descriptive:

- Injunctive norms:
    - Remove shoes before entering the ball pit.
    - Enter and exit the ball pit safely, watching out for others.
    - Share the communal space with others – i.e., only use one cushion and do not take up more space than you need around the top surface of the ball pit.
    - Follow standard business networking behaviour – i.e., introduce yourself, listen and respond to questions, introduce other people you are with, share contact details on request.
    - Use the conversation cards to start conversations.
    - Take your rubbish with you when you leave.
- Descriptive norms:
    - Most people removed their shoes although this was not always the case.
    - At different times of the day, small groups of mostly younger participants took over the ball pit, jumping and diving and making a lot of noise.

- People tended to sit on piles of cushions wherever they were placed rather than just taking the one they needed.
- While some people placed their bags on the floor outside the structure, many took their bags with them onto the upper surface, thus taking up space.
- Few people used the conversation starter cards. It seemed that most people did not notice them at all.
- People did not always take away their rubbish or empty glasses/bottles with them.

Summary and key insights

In the BN setting many people were observed engaging with others, thus suggesting this setting was somewhat effective in supporting the target behaviour. The unique nature of the setting seemed to reduce the predictability of the behaviour episode although patterns did emerge with those deviating from the patterns generally not using the setting for its intended purpose. Such observations were disregarded unless they were seen to have influenced those following the general pattern. As with the other settings, the use of the behaviour setting canvas to critically evaluate this setting revealed several strengths (+) and weaknesses (−) which did not appear to have been anticipated by the designers of the conference. As with the other settings, these insights are summarised below and expanded on in this chapter's discussion.

- **Activity based filter (+/−):** The unique activity (i.e., playing in a ball pit) seemed to attract people who were naturally more open minded, playful, adventurous, and hence willing to try new things. This behavioural filter appeared to contribute to the setting's connectivity success because we would expect people who were more open minded about participating in a fun activity to also be more open minded about connecting to strangers (Landis, 2016). Unfortunately, this factor had two potential downsides. Firstly, it deterred people who were perhaps less socially confident. Secondly, it had the effect of attracting small groups of younger participants who used the ball pit in ways other than for which it was intended (e.g., making noise and jumping/diving into the pit). This seemed to cause other people stay away.

- **Capacity (–):** The relatively small size of the ball pit meant that it could only comfortably accommodate 15-20 people inside the ball pit at one time while there were several thousand people at the conference. As a result, many people who walked by and who otherwise may have been willing to participate were not able to.

- **Accessibility (–):** In addition to the potential psychological barrier described above, the design of the ball pit created a physical barrier for some people. The height of the structure's sides discouraged some people from taking part, either because of how they were dressed (e.g., short skirt or tight trousers) or because they were generally less confident navigating such a structure.

- **Shelving (–):** As this structure was in a high foot-traffic area and the perfect height for people standing outside it to rest their drinks or food, many empty bottles and some food containers were left behind. These were not cleared away regularly and acted as a barrier to others who may otherwise have been interested in participating.

- **Playfulness (+):** The playful nature of the ball pit and unpredictability of the balls (i.e., they could fly in all directions when someone entered) indeed seemed to lighten the mood and generated a lot of laughs. Strangers were frequently bumping into each other 'underwater' (i.e., feet touching under the balls).

- **Shareability (+/–):** The fun and photographable nature of the activity encouraged people to take photos and send to their friends. If those friends were also at the conference, this had the effect of increasing the flow of people to the setting which should improve the likelihood of people connecting. Unfortunately, however, the uniqueness of the setting seemed also to attract many small groups of people who already knew each other but were looking for a fun place to sit, hang out, and take fun photos. When groups took up space in the setting, others, for whom the setting was intended, could not take part.

- **Language (–):** The conference was in a German speaking country (Austria) but attracting an international audience, most communications were in English. This tension was apparent in the BN setting where, for example, the

conversation cards were created in English but the warning signs on the ball pit were written in German. English speakers may have missed the warning signs and German speakers may not have been as confident with the conversation cards.

5.3.4. S4 – Workplace connecting (WC)

Workplace connecting (WC) was the fourth behaviour setting evaluated in this research. The WC setting was the social space (i.e., kitchen, lounge, and meeting area) of an experimental 'smart' workplace within the corporate headquarters of a multinational company. Although dissimilar to the previous three settings which all occurred at business conferences, what the WC setting shared was diversity of participants, uniqueness of the physical space, and a general acknowledgement of the importance of HC. In the three previous settings, diversity of participants was due to the broad range of people attending the conferences. Here, it stemmed from participants working in a range of autonomous yet overlapping project groups which mainly did not know each other. The uniqueness of the space came from the experimental nature of the workplace.

The social area within this space (see magenta section of Figure 16) was identified as the main area in which most connectivity-related behaviour would be observed. The social area comprised: (a) an open kitchen; (b) a long communal table; (c) a collection of comfortable lounge chairs; (d) lockers; (e) a wall-mounted LCD screen; (f) a meeting area with tables and chairs; (g) semi-private intimate conversation booths with bench seats and small tables; and (h) open solo workspaces with small tables and built-in seats. Although each of these could have been treated as separate behaviour settings, we were interested in how they functioned together to create a social area within an office context. In addition, we were seeking to derive any commonalities that helped explain HC behaviour and outcomes between them. Like the previous two settings (S2 and S3), the flexibility of the space afforded a range of potential HC-related routines. Connecting could happen at any time, in any part of the space and between any combination of people. Data collection involved four days of observation, immersed in the setting. In addition, 20 semi-structured interviews were conducted with users of the space.

a. Kitchen
b. Communal table
c. Lounge chairs
d. Lockers
e. LCD screen
f. Meeting area
g. 'Train carriages'
h. Solo workspaces

Figure 16: Layout of the office space within which S4 was situated.

Target behaviour

The target behaviour in the WC setting was informal interaction with another person.

Routine

The flexible nature of the space meant that there was some variation in the setting of interest (eating lunch, coffee chats, work meetings, etc.) and associated variation in the routine. That said, like the previous setting, most encounters followed a comparable routine comprising four main steps, namely: identify, situate, interact, separate – where situating could, in some instances, precede identifying. Given these similarities, behaviour settings theory is used here to analyse the interactions that occurred in the space broadly though specific setting objectives may vary.

Due to the small size and openness of the social area, identification of a potential contact rarely occurred serendipitously except in a case when two people happened to arrive in the kitchen at the same time to make tea for example. Connections were more likely to be initiated through sought, suggested, or seduced tactics. For example, one employee would seek out a specific colleague, making use of the company's intranet, and request to meet. Colleagues could also be introduced by each other. Finally, one person may say or do something that attracted someone else in the space to them. Having found someone to interact with, the next step was deciding where to situate themselves. As described above, there were several options

available to people ranging from completely open areas such as the communal kitchen table or the lounge area, or semi-private areas such as the train carriages. People could also simply stand where they encountered each other, at the kitchen counter for example. Once situated, participants would engage in conversation, the duration of which varied from approximately 2 – 30 minutes. Having completed their encounter, people would separate and would generally return to their work or leave the space.

People

A range of people populated the WC setting, most of whom were employed by the company. As with the previous setting, each bullet includes the title of the person in bold, followed by a description of their role. Each sub-bullet specifies a competency required to fulfil the role.

- **Connector** – the person initiating the connection. The competencies required to fulfil this role include:
    - Visibility so as to be noticed in the space and recognised as being available to connect.
    - Tech savviness in cases where technology was required to find a potential contact and schedule to meet with them.
    - Sociability to feel confident in approaching a person and having a conversation with them.
    - Conversational ability (e.g., listen well and ask relevant questions) to be able to successfully engage with others.
    - Organisational knowledge to support conversations in cases where the target contact may have questions about aspects of the organisation.
- **Contact** - the target of the Connector's attention who responds to the invitation to connect. Required competencies include:
    - Visibility so as to be noticed in the space and recognised as being available to connect.
    - Sufficient social confidence to feel they could successfully engage in a connection with the Connector.
    - Conversational ability (e.g., listen well and ask relevant questions).

- o Work-related skills or knowledge in cases where the Connector is seeking out a specific contact to solve a problem for example.

Note: in the case of serendipitous connections, both people in a dyad play the role of Connector and Contact simultaneously although there is still generally one person who, albeit subtle, makes the first move.

- **Introducer** – A third person (i.e., not part of the connecting dyad) such as a colleague or manager who introduces the dyad to each other. This person may be known one or both of the dyad in advance (e.g., manager or team member) or may have only just met them within the WC setting. Required competencies include:
    - o Social perception to read the situation and believe that the dyad would benefit from being introduced to each other.
    - o Sociability or a willingness and ability to engage with the dyad and make the introduction.
    - o Sufficient level of knowledge regarding the dyad or generally sufficient social aptitude to offer a conversation starter.
- **Management** – These are the most senior members of staff who are not direct colleagues (e.g., team members) of the connecting dyad. These people may work within the office space or may be based elsewhere but visit the space to show people around for example. Some also help to reinforce the rules of the space and are responsible for 'onboarding' new people, including communicating the practices of the space. Required competencies include:
    - o Authority to be seen as superior within the context of the company and therefore expected to set an example regarding intended use of the space including connectivity-related behaviour.
    - o Knowledge of the space and those who occupy it to facilitate introductions to the space and its people.
- **Other space users** – This includes people who use the space for their work but who are not part or the connecting dyad or introducing them. As well as generally taking up space, the role these people play relates to their presence in creating a sense of accountability and in potentially providing examples of acceptable behaviour.

- Cleaning staff – cleaning the office space in the late evening or early morning when it is generally vacant. Their competencies include:
  - Thoroughness – to leave the space clean for the next day so that spaces intended for connecting are not unnecessarily avoided.
  - Timeliness – to complete their cleaning tasks in the allotted time so as not to distract early arrivers from being able to chat.

Stage, Infrastructure, Props

The *stage* of S4 was an experimental 'smart' workspace, custom built to test various technological and atmospheric factors (e.g., light, sound, temperature) on workplace performance. The WC setting (i.e., the social space) was situated at one end of the total workspace. It was a clean, open, modern office space with white walls, lots of glass and carpeted floor. Bright colours were used to accentuate parts of the space. The workspace itself was situated on the ground floor of the headquarters of a multinational company.

The *infrastructure* played an important role in providing numerous options for people to situate themselves to connect. Elements of the infrastructure that contributed to this behaviour setting, including roles and attributes, were:

- A fully equipped **kitchen** with standard appliances (e.g., refrigerator, dishwasher, microwave, coffee machine, kettle, toaster). The role of the kitchen was to provide a communal space for people to store, prepare, and consume food and drinks. Required attributes of the kitchen were that it must be: functional and clean so that people would be willing to use it; sufficiently roomy that multiple people could use it at the same time; and well stocked with the basics (e.g., coffee, tea, milk) to attract people regularly throughout the workday and satisfy their needs.
- A long, wide **communal table** situated in the kitchen with a combination of bench seats and individual stools. The table could comfortably sit 16 people. The role of the table was to provide space for several people to sit and eat together. Required attributes of the table were that it was large enough for several people to sit comfortably and that it was perceived as an attractive place to sit. It must also be clean and adequately hold food or work items. Two

pentagonal **meeting tables** were available at the opposite end of the space. These could be used separately or placed together to create one large table. The location and form of these tables communicate a more official role (i.e., to be used for meetings). They should be sufficiently large to support the number of users. They should also be clean and attractive to use so people are willing to use them rather than leave the space to meet.

- Small **one-person desks** with fixed bench seats were positioned along the perimeter of the social area and were positioned such that users sat with their back to the wall and faced out into the space. The open nature of the desks (i.e., facing the social area) gave users an overview of the space, making it easy to catch the attention of others moving through it.

- Two so-called **"train carriages"** (semi-private covered booths with a small table and two bench seats opposite each other) were positioned at the edge social area on the opposite side to the entrance and kitchen. The train carriages provided intimate spaces for semi-private conversations and were required to be sufficiently comfortable for people to sit and chat and offer some degree of privacy.

- A **small dividing wall** split the area in half, partially separating the kitchen from the rest of the social space. On this wall was mounted a **large LCD screen**. The wall was mostly decorative but also acted as a psychological barrier between the fully open kitchen area and the semi-private meeting area. This wall also provided a structure onto which to attach the screen. The significance of the screen was that it was sometimes used to communicate information about people working in the space. The wall was required to be wide enough to create a psychological barrier and the screen was required to communicate sufficiently useful information that might facilitate connectivity.

- A **'smart' atmospheric system** controlled aspects of the environment such as temperature, light, sound, and air quality. This was managed centrally but as the entire office space was open plan, it also affected the social space. This system was intended to create optimum working conditions for users. This could also influence HC-related behaviours. For example, if it was too cold or too bright in the space, people may choose to go elsewhere for lunch or to

meet others. As such, this system must be suitably calibrated to create comfortable conditions to connect.

Like in the previous settings, numerous props were identified, and these could be categorised as relating to the space itself or personal to individual users. These props as well as their roles and attributes were:

Space-related props:

- **Chairs, stools, and benches** were available in the lounge area and around the kitchen table and meeting tables. These could be moved to suit the needs of the user and needed to be sufficiently comfortable for the duration they were sat on and sufficiently manipulable to be moved to the desired location.

- **Shared appliances** (e.g., kettle, toaster, microwave) were available to all users of the space and could act as permission granting artefacts, supporting people in interacting (e.g., "Are you still using the toaster?" or "Is there enough water in the kettle for another cup?")

Personal props:

- **Clothing items** assumed multiple roles. Due to the type of organisation and the variety of teams working in the space, clothing often communicated a person's role. Those working in creative and technology roles were more casually dressed than those in business and consulting roles. Some items of clothing (e.g., jackets, jumpers, and coats) were used to indicate that a seat was taken. Some items of clothing (e.g., novel items) could provide permission granting cues that might stimulate conversation (e.g., "I love your shoes").

- **Bags / handbags and their contents** performed two main roles. They contained personal possessions (e.g., notebooks, water bottle, electronic devices) and, like jackets, were sometimes used to save seats at tables. Novel items could also invite interaction as above.

- **Electronic devices** were used by most people in the space. Relating to the target behaviour, electronic devices were used for search queries, to look up potential contacts. They were also used for scheduling and messaging purposes, to set up meetings. Like jackets and bags, laptops were often left on a table to reserve a place. The required attributes of these devices were that

they functioned (e.g., had sufficient charge) and were identifiable as belonging to the owner.

- **Cups, mugs, and water bottles** were mostly used for the purposes of hydration although these were also sometimes used like bags, jackets, and laptops to save a place at a table or, when novel, could serve as permission granting artefacts in their ability to stimulate conversation.

Motives

Interviews with participants revealed affiliate, status, and curiosity to be the three primary motives that explained connectivity-related behaviour in this setting.

- **Affiliate** – in this case, the desire for a sense of connectedness with colleagues – was important for most participants interviewed. The experimental 'smart' office space was somewhat isolated from the rest of the headquarters which created a sense of "us and them" and this seemed to strengthen the desire for some people to bond with their teammates. That said, within the space, there were clear divisions along two dimensions. Firstly, some people were fulltime employees of the company and others were external consultants. These two types did not naturally mix. Consultants felt they had to always be seen to be working (i.e., at their desks). Fulltime employees were wary of consultants who could be there one day and gone the next. Secondly, most work was team-based and there was little mixing between teams. In fact, individuals seemed more strongly connected to their colleagues in other parts of the world than they did to colleagues on other teams in the same physical space.

- **Status** – that is, the desire to optimise a person's social position – was a motivating factor for some people to connect with others, particularly when the target of a connection was a person of a higher rank. This organisation was part of a very competitive industry so a person's position within the organisation, and the industry overall, affected the material benefits they received and the power they wielded. Being connected to others of higher rank could therefore be potentially advantageous for benefits such as promotions or being included in more interesting projects. Perceived status could also affect connecting behaviour in another important way. This was evident in the

remark by some that they felt bad for being seen in the social space (e.g., drinking tea at the kitchen table) since they thought others perceived them as not working hard enough.

- **Curiosity** – relating to the collection of (new) knowledge – was another important motivator for some people, although this manifested in different ways depending on a person's role. People in creative roles were motivated by the acquisition of subject-specific knowledge to support the creation of more innovative solutions. People in corporate roles were motivated by the acquisition of organisation/industry-specific knowledge to support the formulation of stronger business models or, related to status above, to help strengthen a person's professional position.

Norms

Our analysis of norms was particularly interesting. Although set within a traditional and highly structured industry and organisation, the workplace in which the WC setting was located was experimental by definition and notably less formal than what was observed in other parts of the organisation. This meant the norms specific to this setting were not well understood by all and this became an issue with not all participants being aware of expected or appropriate behaviour. As with the previous settings, norms could be categorised as injunctive and descriptive:

- Injunctive norms:
  - Share the communal space with others – i.e., do not take up more space on a table than you need; allow others to sit with you at a shared table.
  - Don't use a seat/table longer than you need to, to free up space for others who might want to use your place to sit and connect.
  - Maintain typical business hours (e.g., 9am – 6pm).
  - Take a break for lunch.
  - Eat food in the kitchen space.
  - Return a space to the way you found it – i.e., take away any personal items and clean any marks (e.g., food or drink spills).
  - Follow standard business social behaviour – i.e., introduce yourself, listen and respond to questions, introduce others you are with.

- o Take all personal items away at the end of the day (e.g., take home or secure in a locker).
- Descriptive norms:
    - o Most people either took their food to their desk rather than eating it in the kitchen space, or they left the space altogether and ate in the staff canteen.
    - o Some people (particularly consultants) took no lunch break at all.
    - o Different people arrived at the office between 6:30 and 10:00am and left between 3:00 and 9:00pm.
    - o People did not always clear up their work-related mess (e.g., papers).
    - o Jackets, bags, and laptops were often used to reserve seats when a person was away.
    - o People said hello to each other but seldom more than that.

Summary and key insights

Despite great apparent potential, the WC setting seemed mostly ineffective in usefully supporting people in connecting to others. Our analysis of the WC setting revealed one strength (+) and several weaknesses (–) of this setting in supporting the target behaviour. These are summarised below and compared with those of other settings in the chapter's discussion.

- **Novelty (+):** The experimental workspace was a novelty for most people. It was new and clean and more modern than the rest of the headquarters. In addition, the space contained state of the art systems to control the atmosphere for peak performance. One example of this was the use of visual and audio content to set the mood of the space. Screens would display a range of natural scenes such as rushing rivers, breaking waves, and cattle grazing. These features became talking points which, in some cases, stimulated conversations between people. The novelty of the space also attracted many people not assigned to work there. This increased the likelihood of inter-departmental connectivity.
- **Lack of ownership (–):** The experimental workspace was intended as a living lab. Different teams would spend between three and six months there before

returning to their regular office space. Participants reported feeling that they were just visiting and therefore did not feel incentivised to invest in the space. This may also have applied to connections. That is, people were less inclined to invest in connecting to others if they may not be working together long term. In addition, there was a tendency of some people to not tidy up after themselves. For example, for the entire time our observations took place, there was a pile of papers and miscellaneous cables sitting on one of the meeting tables that was never tidied away. This pile appeared to signal to others that the table was being used even though this was not the case. The table went unused.

- **Performance focus (–):** The emphasis of experiments (e.g., adjusting light, sound, temperature) was on enhancing work output (i.e., performance) rather than improving the social experience within the space. The HC needs of users appeared to be an afterthought.

- **Lack of leadership example (–):** The experimental nature of the space disrupted normalised expectations of users. Expected behaviour seemed therefore to be somewhat ambiguous. Although the newness and uniqueness of the space gave users license to use it as they saw fit, people were not willing to break from corporate norms. This was exacerbated by the lack of leadership from senior colleagues who failed to set the example. One participant mentioned that managers never used the social space (e.g., to eat their lunch) and so he was afraid to do so in case that reflected badly on himself.

- **Ingroups and outgroups (–):** The space was somewhat isolated from the rest of the headquarters. Within the space, work was strongly team-based. Together, these factors meant that there were strong ingroup/outgroup (i.e., us versus them) divisions and little was done to encourage connectivity across the divides.

- **Lack of privacy (–):** Overall, the space was very open in its design. Aside from a few meeting rooms, there were practically no private spaces where people could meet and interact without being seen and possibly heard by others. Several participants mentioned that they would rather meet with other people

outside, in another part of the headquarters building, where they didn't feel like they were being watched.

- **Asynchronous schedules (–):** Lacking clear leadership and clearly communicated norms relating to expected behaviour, people worked according to their own schedules. One consultant interviewed mentioned that he would arrive before 7am so that he could get his favourite desk. He also either skipped lunch or ate at his desk so that he could leave early, acknowledging this meant he was never able to participate in after-work social activities. Others, particularly one team working with colleagues in the United States, would arrive after 10am so that their time zones would overlap. The asynchronous nature of work schedules and patterns (e.g., eating vs skipping lunch) accentuated ingroup/outgroup divisions and reduced the window of opportunity for people to connect.

5.4. Discussion

The behaviour setting canvas provided a powerful, grounded, and structured means to analyse and evaluate four distinct cases representing contemporary work situations where positive HC outcomes are recognised as critical in delivering value for individuals and organisations alike. The breadth and depth of focus facilitated by this approach enabled us to zoom out to get an overview of all elements of the respective settings that influenced HC outcomes, both positively and negatively. Subsequently, the behaviour settings approach facilitated zooming in to understand the roles and requisite attributes of people, props, and aspects of the infrastructure as well as the motives that drove people to connect in the different settings and the norms that guided their behaviour throughout the behaviour episode. While many insights were unique to their respective settings, others were common across settings, thus providing confidence as to the generalisability of some findings to other contexts.

A revealing overall insight is that, for the most part, these solutions (i.e., a networking app, bespoke networking areas, and a workspace) had been designed with little or incomplete understanding of users' HC needs and behaviours. Placing the four settings on a conceptual scale ranging from "unthoughtful and ineffective" to "thoughtful and effective" (as it relates to HC) would reveal something such as

illustrated in Figure 17. While there was some intention to facilitate or support HC in the other three settings, S1 (braindates) was the only setting in which HC appeared to have led design decisions. The braindates solution was relatively effective in facilitating HC outcomes although our behaviour setting evaluation helped identify a key weakness of the solution which was its emphasis on just part of the total routine (i.e., matching people), to the neglect of other parts (i.e., supporting people during the 'date' itself). In S4 (the experimental workspace), HC was recognised as important but was secondary to the pursuit of other outcomes which prioritised testing 'smart' technologies to improve employee performance. There was minimal evidence that thoughtful effort had been made to support people in connecting. Similarly, in S2 (outdoor networking) while it was intended that people would connect, little thought was given to how the setting might be used and whether it catered equally to all participant types. In S3 (ball pit), HC was clearly an objective or ambition but there the emphasis seemed to be on creating a fun activity rather than seeking to understand user needs and how aspects of the design might help or hinder outcomes. This overall observation, reflected in participant interviews, suggests that designers in all settings lacked the knowledge and tools that could have supported the creation of more effective solutions. Furthermore, this observation common to all four cases highlights the value of behaviour settings in supporting the design process. As well as supporting deeper and more specific contextual understanding, behaviour settings also support the isolation of the mechanisms that affect behaviour in a given setting as well as the relationships between them. This helps designers and practitioners understand how changes in one part of a setting will affect other parts.
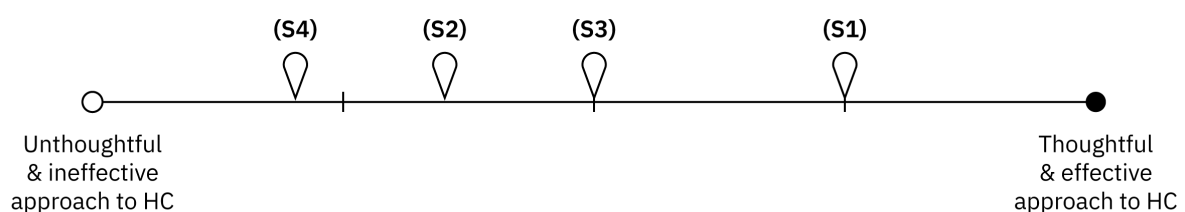
Figure 17: Thoughtfulness and effectiveness of human-connectivity related design in the four settings studied.

Another important insight gained from all settings related to the common misalignment between the intended and observed impact of some elements (e.g., props or aspects of the infrastructure) in encouraging desired behaviour. In S1, this was exemplified by the power outlets. Although power outlets were intended to add value (i.e., convenience), enabling participants to charge their devices while they interacted, the outlets had the unintended consequences of encouraging people to linger and attracting the wrong kinds of people. In S2, the picnic tables, which were an affordable furniture solution intended to make the space feel informal, had the unintended consequence of alienating some people who were uncomfortable navigating the bench seats. In S3, the playfulness of the ball pit attracted some people who were more interested in jumping and diving rather than connecting, unintentionally rendering the setting useless for others. And in S4, strong social norms and the open-plan design meant that despite the kitchen table being the perfect design for group gatherings, people were reluctant to use it due to its visibility.

Another example of misalignment related to the impact of novelty on target outcomes. On the one hand, a novel setting or object can be beneficial in stimulating conversation (Eggebert, 2018) and giving people creative license to behave in new ways. However, without clear guidance (i.e., communication or demonstration of acceptable normative behaviour), people can lack the confidence to participate at all. Although S1 and S4 were both novel settings for participants (i.e., a new networking experience and a smart workspace respectively) thus offering much interaction-stimulating potential, one distinct difference was that in S1 expected behaviour and the intended routine were clearly communicated. People knew exactly what they were supposed to do. This was further supported in S1 by numerous props that supported people through the routine. The flexibility of the routine in S4 and general lack of guidance for what was accepted or expected (e.g., through instruction or example by senior staff) seemed to result in people playing it safe which severely limited HC potential.

A closer consideration of motives also provided valuable insights in all settings. A key difference between the conference settings (S1, S2, S3) and the workspace setting (S4) related to the source and type of motivation to connect. Making new

connections is a common and explicit reason for people to attend business conferences (Chai & Freeman, 2019). In workplace settings, however, an individual's motivation to connect may be less explicit and may be more driven by the organisation due to the acknowledged link between HC and team performance (Volini et al., 2019). Although it may be argued that in both types of setting people are motivated to connect, acknowledging the distinction between motives, as facilitated by the behaviour settings approach, supports a more nuanced understanding of why people do or don't behave as desired. In the case of S4, this helps explain why connecting was less of a priority for some people who simply wanted to get on with their work.

A seemingly overlooked yet important role in S2, S3, and S4 was that of the "introducer" (i.e., a person who introduces the dyad to each other). This was sometimes an existing contact to one of the dyad but could equally have been a stranger to both until immediately prior to their interaction. In all three settings, introducers were extremely effective in brokering connections. This can be explained by the general sense of anxiety many people have when approaching strangers due to a fear of rejection (Flynn & Lake, 2008). Being introduced by someone all but eliminates the potential for rejection. The importance and effectiveness of this role in these settings suggests more could be done to encourage people to assume the introducer role and in generally supporting introducers.

A final overall insight observed in three of the settings related to the perceived lack of understanding of the diversity or specificity of participant needs. For example, in S1 it was not anticipated that participants might like a drink while they chatted. Lacking access to drinks within the setting (e.g., café or bar) meant that many people left to interact elsewhere. In S2, it was not anticipated that participants would have to wait a long time in queues for their meals and would hence waste time that they could have been connecting. In S4 the asynchronous work schedules and diversity of peoples' roles (e.g., creatives versus consultants) had been overlooked. A combination of strong ingroup/outgroup divisions and non-overlapping schedules in this setting reduced the likelihood of interactions. This has important implications for designers and practitioners who may overlook key user groups' needs or may be unwittingly biased toward designing for an imaginary "ideal user" who is not representative of

the setting's population. The behaviour setting canvas can play a critical role in preventing such oversights. The canvas requires articulation of not just the relevant people in a behaviour setting but also their respective roles and related competencies, and the motives and norms that influence their behaviour. With this level of understanding, designers and practitioners are in a better position to scope HC challenges with a far greater degree of nuance, generate more targeted design solutions, and more accurately and effectively evaluate existing solutions.

5.5. Conclusion

This chapter comprised a deep and structured evaluation of four cases situated within two contemporary work situations, namely multi-disciplinary business conferences and experimental 'smart' workplaces. Behaviour settings theory, made practical through the behaviour setting canvas, provided a useful framework to guide this evaluative design process. Firstly, behaviour settings supported zooming in to consider each specific element in a setting and how it helped (or hindered) the target behaviour. Secondly, this approach was also useful in the way it supported zooming out to consider interrelationships between elements and how modifications to specific elements may have affected other elements within the respective settings.

The work presented in this chapter makes four important contributions. Firstly, while not a primary objective, this research facilitated the co-creation and iterative prototyping of the behaviour setting canvas together with with collaborators. The second contribution of this chapter is that this is, to our knowledge, the first time that behaviour settings theory has been used as an evaluative tool to understand HC-related behaviour in these contexts. This work therefore adds to existing behaviour settings literatures. Thirdly, the behaviour settings approach supports designers and practitioners in being more deliberate and comprehensive in addressing HC challenges or leveraging HC opportunities. The two levels of understanding afforded by behaviour settings (i.e., *zoomed out* to identify all relevant elements in a setting and *zoomed in* to determine the specific role of each element) support designers and practitioners in generative as well as evaluative design activities. That is, in guiding decision making to improve an intervention's chance of success, and in helping explain why an existing intervention works or does not work. The fourth contribution

of this research is the broad collection of insights that help explain HC outcomes (or lack thereof) in the contexts studied. These insights deepen our understanding of the mechanisms that help and hinder the HC process. Commonalities in these insights across the various settings provides confidence as to their generalisability to other contexts.

Improving HC outcomes is critical in contemporary work situations. Through their connections to others, people in such contexts derive considerable value in many forms. Design can play an essential role in ensuring the optimisation of settings in such contexts to ensure target HC outcomes are attained. Currently, designers and practitioners lack the knowledge and practical tools that can support them in taking a more thoughtful and structured approach to DfHC. The behaviour setting canvas and the insights derived from the current research go a long way toward addressing this gap.

6. Design Prompts – a tool to support DfHC

"Understanding a problem is only halfway to solving it.

The second step is to develop and test (alternative) solutions"

(van Aken, 2004, p. 220)

6.1. Introduction

Throughout this thesis we have repeatedly highlighted a key imbalance in HC research and practice is the over-emphasis on HC outcomes to the neglect of the HC process. Not only are Connectors and Contacts generally unsupported throughout the HC process, designers and practitioners are also generally unsupported in their attempts to improve this process to address HC challenges and improve outcomes through the things they design. The lack of support for people seeking to connect points to a need for more and better designed solutions to address HC challenges. The lack of support for designers and practitioners points to a need for tools to support DfHC.

Considering the deficiencies identified thus far in the formalisation of DfHC, the need for tools to support DfHC is acute, particularly around the scoping of HC challenges and the evaluation of HC outcomes. When HC challenges can more effectively and more accurately be scoped, the relevance cycle (chapter 2) is enhanced and the requirements for a design solution can be better articulated. The specification of these requirements also provides the criteria against which design outcomes may be measured. Together, this supports generative HC design activities such as conceiving new interventions or improving existing interventions. It also supports evaluative aspects of design such as analysing the effectiveness of existing interventions in the field (i.e., in the relevance cycle) or seeking to determine how effective a new intervention will be (i.e., in the design cycle). There exist many types of tools that support various phases of the design process. Prior research usefully documents tool *types* (e.g., Peters et al., 2020) and *forms* (Dalsgaard, 2017) thus aiding the selection and creation of a new tool to support DfHC.

In this chapter, we present our approach to the scoping and development of a tool – a set of 19 design prompts – that we show can support designers and practitioners in generative and evaluative DfHC activities. Scoping supports specification of the tool's requirements, thus indicating the ideal type and form of the tool. Development of the prompts is achieved through a process of iterative coding to derive a set of distinct yet interrelated factors shown to influence the HC process in contemporary work situations exemplified by co-workers seeking to meet their HC objectives in co-working spaces. The prompts correspond with second-order themes (Corley & Gioia, 2004) that emerged through coding. Coding builds on three main sources of data: in-depth interviews, existing HC-related literatures, and feedback from the prompts' application in the real world. The behaviour settings work (chapter 5) also provided useful support in that behaviour setting elements (e.g., competencies, roles, motives, and norms) supply a language and structure to maintain clarity between the prompts and confidence in their validity. This combination of data sources supports a form of data triangulation, which adds confidence as to both the external and ecological validity of the prompts (i.e., that the prompts are generalisable to other contexts and real-life settings respectively) (Andrade, 2018). In addition to the specific support the prompts offer designers and practitioners in more effectively identifying and addressing HC challenges and opportunities, the organisation and vocabulary offered by the prompts further supports the structuring and general formalisation of DfHC.

6.2. Scoping: Tool requirements, type, and form

Scoping the tool involved specifying the requirements that the tool should fulfil. The type of tool most likely to meet these requirements, as indicated by existing tool taxonomies and prior research, was then selected and developed. The requirements for the tool are summarised in Table 13 and explained in more depth thereafter, along with our tool selection process.

Type of support	Requirement	Benefit(s) / Rationale
Creativity	The tool should stimulate thinking beyond the obvious, provoking designers and practitioners with a full range of possible explanations for HC outcomes.	• Provides a holistic framework for consideration of a broad range of HC challenges and opportunities. • Provokes thinking to unlock ideas that may otherwise be overlooked or not seen as relevant.
Collaboration	The tool should facilitate dialogue within and across disciplines and provide a consistent scaffolding (i.e., vocabulary) upon which to grow DfHC.	• Supports general HC-related communication, for design research and practice, providing confidence that people are talking about the same thing. • Acts as boundary-type object to facilitate communication across disciplines (e.g., between designers and managers). • Provides scaffolding for the organisation of knowledge.

The current lack of formalisation of DfHC helps explain the tendency of many designers and practitioners to overly rely on intuition and experience when seeking to identify, scope, and address HC challenges. This can have knock-on effects throughout the design process because the success of a design output is directly related to how the design challenge is understood (Patel et al., 2019). Lacking a nuanced understanding of the specific factors that influence the HC process, designers and practitioners often revert to the same "safe" (i.e., predictable, and broadly focused) solutions such as networking events and happy hours in attempting to improve HC outcomes. These standard solutions often lack creativity and specificity. In addition, without the requisite specificity affording a nuanced understanding of the HC process, it is unsurprising to note that the outcomes of many HC-related design activities are not able to be accurately measured. This highlights the first main requirement of a tool to support DfHC. That is, the tool should support ***creativity*** in DfHC, in the sense that it provokes designers and practitioners to think beyond obvious HC challenges, solutions, and explanations.

Prior lack of formalisation of DfHC also helps explain the isolated nature of much HC-related research and practice. As our literature review (chapter 2)

highlighted, there is undoubtedly valuable HC-related research and design work being done. However, without a consistent structure around which to organise this work it can be difficult to compare. It can also be difficult for research and design outputs to usefully contribute to the HC knowledge base. The lack of structure relates not just to frameworks and methods to guide design activities. Simply not having a consistent vocabulary with which to communicate around DfHC makes collaboration difficult as designers and practitioners cannot be sure they are talking about the same things. In design, the ability for diverse stakeholders to communicate effectively is critical "whether this pertains to understanding their needs, enabling them to explore solutions together, communicating design concepts, or evaluating them." (Markopoulos et al., 2016, p. 4). This is particularly true in DfHC given the complex and multi-dimensional nature of many HC challenges. A consistent DfHC vocabulary will begin to address these deficiencies. Key terms can provide essential scaffolding for the organisation of knowledge and act as boundary-type objects (Star, 1989) to improve understanding and collaboration between disciplines. Together, these factors highlight the second main requirement of a tool to support DfHC. That is, the tool should support **collaboration** in DfHC.

There exist many types of tool that support creative and collaborative design activities, particularly in the early stages of design where the design situation is perceived and understood and the design problem is formulated (Dalsgaard, 2017). Peters et al., (2020) provides a useful taxonomy of many such tool types – which includes methods, prompts, components, concepts, stories, embodiment, and construction – noting that tool types are not mutually exclusive. Of all these types, *prompts*, which include "provocative questions, triggers or abstract visuals to prompt divergent thinking" (Peters et al., 2020, p. 8) are deemed best suited to meet our requirements of supporting creativity and collaboration in DfHC.

Sets of cards are a common form for the embodiment of prompts (Roy & Warren, 2019). Such cards act as 'instruments of inquiry' (Dalsgaard, 2017), supporting creative and collaborative design activities such as facilitating creative combinations of information and ideas, providing a common basis for understanding and communication in a team, supporting externalisation of design elements or

information, and providing convenient summaries of useful information and/or methods (Roy & Warren, 2019, p. 131).

Triggering and prompting divergent thinking satisfies our requirement that the new tool provides *creative* support in that prompts may aid designers and practitioners in thinking in new directions and exploring ideas not otherwise considered. In this way, prompts address the current tendency to narrowly focus on one HC-influencing factor in isolation, to the neglect of other factors or the greater context. The way prompts provide a common basis for understanding satisfies our requirement that the new tool supports *collaboration*. This is achieved through the way prompts can facilitate combinations of information and ideas (i.e., multiple factors combining to influence the HC process) while also providing a consistent language with which to communicate within and between disciplines. In this regard, prompts can act as boundary-type objects which "enable 'one group to speak to another' (Carlile, 2002) by providing a shared language which is meaningful to all stakeholders." (Melville-Richards et al., 2020, p. 519). Where the above benefits relate mostly to generative design activities, the added insights and nuance provided by a comprehensive set of prompts will also support evaluative design activities by better equipping designers and practitioners to analyse HC outcomes with a greater degree of specificity and depth of understanding.

In the following sections, we describe our approach to the development and application of the tool – a set of prompts to support DfHC. In the next section (6.3), the first three stages of development are described in more detail. We then present the prompts (6.4), before describing how the prompts were applied in the field (6.5) and what was learned (6.6). As such, the methods in this chapter are broken into two parts (6.3 and 6.5).

6.3. Methods (a): Development of the prompts

As outlined in this chapter's introduction, development of the prompts occurred through an iterative process of coding, framing, grounding, and refining. This was supported by four distinct yet interconnected research steps (Figure 18):

a) Semi-structured in-depth interviews of members of co-working spaces.

b) Derivation of factors (barriers and enablers) that influence the HC process.

c) Articulation of positively- and negatively-framed factors as neutrally-framed prompts, together with guiding questions and explanations.

d) Application of the prompts in three real-world cases, in generative as well evaluative ways.

A feedback loop supported continuous refinement of the prompts during their application.
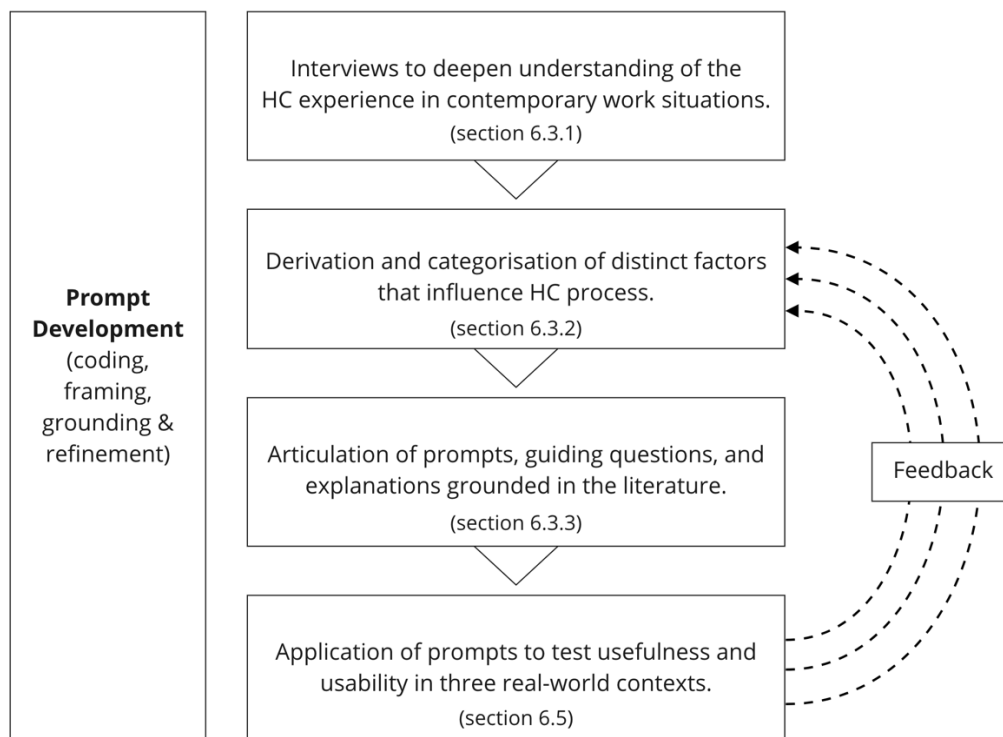
Figure 18: Methodology to develop the HC design prompts

Our literature review (chapter 2 – see, in particular, section 2.3.3) had highlighted several individual, social, and contextual factors that influence the HC process. It was not clear, however, if these insights were necessarily generalisable to contemporary work situations. To determine this and identify any additional factors

that influence the HC process in such contexts, our first research step was to conduct in-depth interviews with members of co-working spaces, another example of a contemporary work situation where people are strongly motivated to connect to others yet unfamiliarity of people and context can make connecting particularly challenging. In the second step, interview transcripts were analysed to derive the distinct factors that influence the HC process in this context. In the third step, these factors were abstracted as a set of prompts, each with a guiding question and an explanation grounded in the literature. In the fourth step, the prompts were applied in the field, in three unique case studies. To distinguish the steps from each other and thus aid communication, here and in Figure 18 they are presented as a linear sequence. In reality, however, the steps were generally overlapping and/or repeated as we returned to some steps multiple times in a process of constant comparison (Strauss & Corbin, 1998). This iterative process supported continued refinement of the prompts and their application.

6.3.1. Interviews to understand the HC experience

To deepen our understanding of the HC experience in contemporary work situations we conducted in-depth interviews with established members of co-working spaces. Co-working, in its current form, is a relatively recent phenomenon which began in the mid 2000s when Brad Neuberg, a New York based entrepreneur, offered up the spare desks in his over-sized office to strangers (Fost, 2008). Since then, co-working has grown into a multi-billion dollar industry with co-working spaces available in most developed cities across the globe (Spinuzzi et al., 2018). Co-working fits our description of a contemporary work situation due the heightened unfamiliarity of people (members are mostly strangers to each other, generally working for different companies) and context (accepted norms vary between co-working spaces and are generally open to individual interpretation). Co-working spaces are of particular relevance to this work as "connecting to others" or "joining a community" is recognised as an important factor that motivates people to join a co-working space and is touted by most co-working spaces as part of their unique selling proposition (Spinuzzi et al., 2018). In other words, members of co-working spaces are highly motivated to connect to others but the conditions in which they are seeking to do so

can be particularly challenging. This combination of factors (i.e., a strong motivation to connect in conditions less conducive to connecting) makes the co-working context representative of many other organisational contexts and thus provides confidence as to the potential generalisability of insights to other contexts.

In adhering to the principles of theoretical sampling and constant comparison (Strauss & Corbin, 1998), we were purposeful in our selection of participants. Following an initial selection of a sample of participants deemed likely to provide a suitably broad range of insights, we then adopted a snowballing technique whereby participants were asked to recommend others whose experience of HC in the co-working context could address perceived gaps or provide additional insight into the areas of particular interest. As mentioned earlier, this procedure was iterative and included simultaneously collecting and analysing (i.e., organising and coding) data from participants. This process was continued until saturation was achieved in that no new information emerged during coding (Strauss & Corbin, 1998), and we were confident in our list of factors articulated as prompts.

A total of 26 in-depth semi-structured interviews were conducted with people who had been members of a co-working space for 3 months or longer. Participants (18 female) were aged 27 to 52 years and were located in 14 cities (10 countries), thus providing an internationally diverse sample. Diversity was also achieved in the types of co-working memberships represented with a mix of hot-desk members (freelance or sole-trader members who used a space on a part-time basis and changed their seating location), fixed-desk members (freelance or sole-trader members allocated to a permanent desk who therefore sat in the same location each day), and private office members (generally employees of companies with a private office space within a co-working space but who shared the communal spaces – e.g., lounge area, kitchen, and bathrooms). Diversity was sought to offer a range of perspectives and experiences (Creswell, 2007). Interviews were mostly conducted remotely (e.g., via phone, Zoom, Skype) and had an average duration of 43 minutes. Participants were asked about their experience of HC in the context of the co-working space, with particular emphasis on barriers and enablers to the HC process. Interviews were recorded and transcribed verbatim.

6.3.2. Factors that influence the HC process

Interview transcripts were coded through a sequence of open, axial, and selective coding to identify concepts and their properties, to relate categories at the level of their properties, and to integrate and refine categories respectively (Strauss & Corbin, 1998). Our focus was on the derivation of the distinct factors that were recognised as influencing the HC process. These factors, which correspond to 'second-order themes' from the coding process (Corley & Gioia, 2004), were negatively or positively framed as barriers and enablers respectively. The emerging factors were reviewed by the second researcher and iterated for clarity and differentiation. In addition, the initial set of factors, subsequently reframed as design prompts (see next section) was continuously iterated as the prompts were used in practice to support design activity (section 6.5). This process helped to refine the initial set of prompts as new factors were identified and others were combined or eliminated. Factors (and subsequently the prompts) were organised according to three categories – Connector-related, Contact-related, and Context-related.

The first category includes factors generally attributable to the **Connector**. These factors are mostly psychological in nature and include: the Connector's belief in their ability to successfully connect to others; how motivated the Connector is to connect to others; the anxiety the Connector may feel about connecting to others; and the Connector's general attitude toward connecting to others. We labelled these factors: Ability, Apathy, Apprehension, and Attitude respectively.

The second category includes factors generally attributable to the **Contact**. These factors include: the total number of potential contacts present; whether the Connector likes the Contact(s); how relevant the Connector finds the Contact(s) to be; the balance of reciprocity in what the Contact has to give to or take from the Connector; how genuine the intentions of the Contact appear to be; the perceived balance of power or status in the connecting dyad; the (physical/digital) availability of Contacts to connect; and the Connector's level of awareness regarding Contacts with whom they may connect. We labelled these factors: Abundance, Affinity, Applicability, Asymmetry, Authenticity, Authority, Availability, and Awareness respectively.

The third category includes factors generally attributable to the broader *context* (i.e., not specific to the connecting dyad themselves). These factors include: the extent to which an intervention (e.g., an event) is equally accessible to all; the props and other supports that help the HC process; clarity, understanding, and acceptance of norms that guide connectivity behaviour in a particular context; the way the physical or digital space supports or inhibits the HC process; how well target outcomes (i.e., measures of success) are defined; the role other people play in supporting the HC process; and how the general 'vibe' contributes to HC outcomes. We labelled these factors: Accessibility, Aids, Appropriateness, Architecture, Assessment, Assistance, and Atmosphere respectively.

6.3.3. Prompts, guiding questions, and explanations

Our next step was to represent the positively and negatively framed enablers and barriers from the previous step as neutrally framed prompts. Because our intention was to create a generalisable tool that would trigger creative thinking (i.e., provoke consideration of a broad range of possibilities in a broad range of contexts) it was important that the factors not be positively or negatively weighted or overly prescriptive. In other words, the prompts should support designers and practitioners regarding what to think about, rather than prescribing an ideal outcome or suggesting a prompt is necessarily good or bad. To achieve this, we took inspiration from Peters et al.'s (2020) description of a prompt (i.e., "provocative questions, triggers or abstract visuals to prompt divergent thinking" p. 8) and generated a question for each prompt to trigger thinking. We labelled these "guiding questions".

To complete the prompts' content and further support designers and practitioners in their understanding of how each prompt can influence the HC process, we returned to the literature to generate short explanations that briefly introduce each prompt's underlying HC-related mechanism(s). Here we provide a summary of these mechanisms organised according to the three categories of Connector-, Contact-, and Context-related prompts.

Connector-related prompts

Ability to connect with others is recognised as something that people can be both proficient and deficient in (Zack, 2019). As well as the skills required to interact, other supporting skills, such as the ability to manage one's time are also shown to affect a person's ability to connect to others (Nurmi, 2011). *Apathy* can be described as a lack of motivation to connect and has been shown to occur simply because of the perceptions people hold about the act of connecting (Kuwabara et al., 2018) or because they believe, mistakenly, that they are better off alone (Epley & Schroeder, 2014). *Apprehension* can partially be explained by a fear of rejection which is discussed in numerous studies and may originate from humans' fundamental need for belonging (Baumeister & Leary, 1995). Having the right *Attitude* toward connecting with others is recognised as affecting HC outcomes where being generally more open to situations as well as people is likely to be beneficial (Gino, 2015; Zack, 2019).

Contact-related prompts

Abundance is explained by cognitive limits that can cause distress when a person is presented with too many options (Schwartz, 2004) and that restrict the number of social connections a person can maintain at any one time (Dunbar, 2011). *Affinity* is seen as essential to the establishment of valuable workplace relationships because people need to like each other to fully engage (Casciaro & Lobo, 2008). Much research has explored how perceived *Applicability* influences how people behave toward others, with ingroup members (i.e., those deemed more applicable) being treated favourably and outgroup members discriminated against (e.g., Levine et al., 2005; Tajfel, 1970). *Asymmetry* is deeply rooted in the social norm of reciprocity wherein people sharing something with another person expect something in return (Carpenter & Greene, 2015). The relevance of *Authenticity* is in part explained by the way humans are experts at "reading" the intentions of others (Tomasello et al., 2005), so when a Contact is acting inauthentically, it is generally quite obvious and can hinder connectivity efforts. Just as important however, is when Connectors are able to behave authentically – aptly described by Brené Brown (2013) as "letting go of who we are supposed to be and embracing who we are" – connections are likely to be stronger and more meaningful. Regarding *Authority*, prior work highlights how a

person's sense of power in a given context, often related to their sense of authority, influences HC outcomes (Landis et al., 2018). The importance of *Availability* is obvious. Connecting is difficult when people aren't available to each other (e.g., Wohlers & Hertel, 2018).

Context-related prompts

Accessibility has been explored from a variety of perspectives, ranging from how experience design can disadvantage women in some networking contexts (e.g., Greguletz et al., 2018) to the so-called "digital divide" that denies certain segments of a population access to connectivity services (Bavel et al., 2020; ONS, 2019). *Aids* have been shown to play a critical role in supporting HC outcomes. This is explained by the role prompts, props and other communication-related artefacts can play in creating the conditions for connectivity to occur (Fayard & Weeks, 2007), supporting people in having more meaningful conversations (Aron et al., 1997), and in granting explicit permission for people connect (Mandeno & Baxter, 2021). Prior research related to *Appropriateness* highlights how social norms influence shared culture in organisations (Inkpen & Tsang, 2005), and how situational structure sets expectations regarding appropriate behaviour (Meyer et al., 2009). The *Architecture* of digital and physical environments is well understood to support HC through, for example, the provision of privacy and increasing physical proximity (e.g., Allen, 2007; Zerella et al., 2017). *Assessment* is recognised as an important step in the design process in order to provide the insight necessary for continual improvement of the design (Ploos van Amstel et al., 2017) or to gain buy-in from key stakeholders (Design Council, 2007). Extant literature on *Assistance* considers the important role other people (e.g., hosts) can play in brokering and facilitating connections (e.g., Halevy et al., 2019), and on the role played by the host in social gatherings (e.g., Ingram & Morris, 2007). And finally, the *Atmosphere* of a setting is recognised as potentially creating a sense of psychological safety in which people are more likely to open up, thus facilitating HC (Nembhard & Edmondson, 2011).

In generating the explanation for each prompt, grounded in the literature, we remained conscious of three recognised potential weaknesses of sets of cards as design tools in that they may: overload users with too much information, over-

simplify information due to space limitations, or make concepts too complicated for users to understand and apply (Roy & Warren, 2019, p. 131). We thus sought to strike a balance between providing sufficient information for a designer or practitioner to understand the relevance and meaning of the prompts while not over-simplifying or unnecessarily complicating them. Through multiple iterations, we specified that explanations should be 60 words or less and should follow a consistent meta-structure.

6.4. Results: 19 design prompts to support DfHC

Here we present the complete set of prompts (Table 14), including guiding questions and explanations as described earlier. Prompts are again organised into the three categories of Connector-, Contact-, and Context-related.

Table 14: 19 design prompts to support DfHC

Label	Guiding Question	Explanation
Connector-related prompts		
Ability	Do people have (or believe they have) the requisite skills to connect effectively?	Connecting to others requires skills dependant on the context, the specific roles played by individuals, and the phase of the HC process. Skills, or lack thereof, can influence a person's confidence to connect and ultimately HC outcomes. Some skills can be taught and the skills gap can be lessened by manipulating the context.
Apathy	Are people motivated and willing to put in the requisite effort to connect to others?	People must first be motivated to connect because connecting requires investment of personal resources (e.g., time, energy, knowledge). When the return on this investment (i.e., the value of a connection) is not clear, people can become apathetic. Motives are not always obvious and in the same context different people can be motivated by different things.
Apprehension	Are people in any way apprehensive about connecting to others?	For people to connect effectively the perceived risk (social or otherwise) must be less than the anticipated benefit. The perception of risk can make people apprehensive and subsequently avoid HC situations. Unfamiliarity (of people or contexts) can heighten perceived sense of risk. Identifying commonalities and supporting people in the initial phases of HC can reduce apprehension.

Attitude	Do people's attitudes toward the process and experience of human connectivity affect outcomes?	Achieving HC outcomes requires that people have a positive attitude toward the HC process. Negative attitudes, often shaped by poor prior experience, false assumptions, or social norms, may cause people to disengage or avoid HC activities. It is critical to understand the mindsets of key stakeholders.
Contact-related prompts		
Abundance	Does actual or perceived size of a group influence people's likelihood to connect?	There are limits to the number of connections a person can form and maintain. In large groups, people can become overwhelmed with the number of options to connect, and excessive connecting can deplete resources. Managing group size can reduce this sense of overwhelm and help focus attention.
Affinity	Do target stakeholders generally like each other?	Even in purely instrumental connections, some mutual affinity is required for successful HC. Lack of affinity can stem from (often false) biases or assumptions based on signals from others, ranging from product choices to political affiliations. People can't be made to like each other but biases and incorrect assumptions can be addressed.
Applicability	Do people recognise how they are or might be applicable to each other?	People are more likely to connect when they believe they are applicable to each other. When others are perceived as inapplicable, people may be less willing to invest in a connection. Perceived applicability can be influenced by the framing of an activity and the context and enhanced by highlighting commonalities. What people have in common might not be obvious to them.
Asymmetry	Do people feel that connections are balanced regarding the value people are giving and receiving?	Successful connections tend to be symmetrical in terms of the value exchanged between people. Asymmetric connections can leave some people (those giving more) feeling dissatisfied and others (those getting more) feeling guilty. The nature of value exchanged need not be the same and the exchange need not be simultaneous.
Authenticity	Are people able to be themselves and do they behave authentically toward each other?	Authenticity is generally a prerequisite for trust in a connection. People acting disingenuously can struggle to establish meaningful connections. Authentic behaviour can be stimulated and supported by the framing of an activity and clearly set norms.
Authority	Does the authority some people have over others influence	Authority (perceived or actual) can influence the dynamics of a connection. Low-status individuals can be intimidated by those with high-status. Authority is context specific and may derive from

	human connectivity outcomes?	social class, hierarchy, a person's skills or knowledge, and more. Perceived authority can be influenced by the way an activity is framed.
Availability	Are people sufficiently available to each other for connecting to happen?	To connect, people must be available to each other, temporally and physically or digitally. The amount of time and type of access (e.g., physical or digital) required will depend on the type of connection and specific HC objectives. It is critical to understand the ways people may be made available to each other.
Awareness	Are people aware of prospective contacts with whom they may connect?	To connect effectively, people must be aware of others with whom they can connect, at an individual (i.e., a specific person) or category (i.e., type of person) level. Lacking awareness, connectivity opportunities are missed. Awareness may be enhanced through explicit communication or by stimulating curiosity for example.
Context-related prompts		
Accessibility	Are HC activities equally accessible to all people?	HC opportunities should be equally accessible to all relevant stakeholders. Activities can inadvertently favour some people and be less accessible to others due to a range of factors from financial to technological and physiological to geographical. It is important to understand the perspectives and needs of all relevant stakeholders.
Aids	What props, prompts, communications, and other materials are present and what role do they play in aiding connectivity?	People often require permission-granting props, prompts, communications, and related materials to aid their connectivity efforts. Aids may be explicit (e.g., conversation starter cards) but may also be more subtle (e.g., furniture position that places people in close proximity). The effectiveness of different aids will depend on the specific context.
Appropriateness	Are appropriate social norms agreed and understood by all relevant stakeholders?	People must understand contextually appropriate social norms to guide connectivity-related behaviour. When appropriate social norms are unclear or conflicting (e.g., diverse groups in which different people behave according to different norms), some people may lack confidence in connecting to others or avoid connecting altogether. Appropriate norms should be clearly communicated.
Architecture	How does the built environment (physical or digital) support people in connecting?	The design of a physical or digital space must support the HC process by setting the tone, helping people to navigate throughout a space, and ensuring sufficient proximity. A poor layout can prevent the right people with the right mindset

		being in the right place at the right time. All aspects of a physical/digital space should be considered.
Assessment	Are human connectivity objectives clear and is there an agreed measure of success?	A clearly defined measure of success is required to assess if a design has been effective in achieving its stated HC objectives. Lacking a means of assessment makes decision making and the evaluation of a design difficult. Assessment need not be complicated and can be based on qualitative as well as quantitative measures.
Assistance	What role does or could the 'host' play in assisting people in connecting?	The 'host' of an activity can play a critical role in assisting people to connect. Lacking assistance, many people are likely to miss opportunities. Assistance may be direct (e.g., brokering connections between participants) or indirect (e.g., setting an example regarding desired/expected behaviour).
Atmosphere	How does the general atmosphere contribute to human connectivity outcomes?	The way a design feels (i.e., the 'vibe') can have a dramatic impact on HC outcomes by influencing the way people feel and behave. This relates equally to the physical atmosphere (e.g., temperature, noise, lighting) as it does to the social or psychological atmosphere (e.g., formal vs fun). The atmosphere must support desired behaviour and HC outcomes.

6.5. Methods (b): Application of the prompts in the real world

Following a pilot session within our departmental research group the prompts were applied in three real-world cases (C1, C2, and C3) (

Table 15). Cases differed in terms of type of organisation or institution, number of participants, business context, and the HC objectives.

In applying the prompts in these real-world cases, we were most interested in their usefulness and their usability. That is, how useful do designers and practitioners find the prompts to be and how easy or intuitive are the prompts to use? We were also seeking to understand to what extent the prompts supported generative as well as evaluative design activities. Feedback was collected through a combination of observation, discussion, and surveys. In all cases, feedback was received live at the end of each workshop with an open discussion. Participants were asked what they liked, what they would change, and in what other contexts they saw the design

prompts as being useful. In C1, feedback was also collected by way of a feedback survey sent to participants following each respective session. Analysis of feedback data provided valuable insights that were subsequently fed back into the next iteration of the prompts prior to their subsequent application.

Table 15: Three real world cases in which the design prompts are applied

Case	Target Connectors	Participants	Objective(s) O=Overall, E=Evaluative, G=Generative,
C1	Members of a large (45,000+) medical association (US).	7 Staff members representing multiple departments. Responsible mostly for program, event, and communications design.	O: Improve HC experience to help members derive more and different types of value from each other. E: Critically evaluate strengths and weaknesses of current HC activities. G: Generate feasible solution ideas to address critical HC challenge and opportunity areas.
C2	Current and prospective students at a university (UK).	8-member cross-disciplinary project team. Combination of trained designers, student representatives, and faculty.	O: Develop a 'cohort building' toolkit comprising implementable interventions for improved HC across campus. G: Generate a broad range of implementable HC interventions addressing specific and diverse student needs.
C3	Current cohort and alumni of creative leadership program (NL).	Program Director and Global Head of Community.	O: Strengthen connections among 700+ diverse and globally dispersed alumni and broader network. E: Improve understanding of strengths and weaknesses of HC strategy and activities.

The pilot comprised a 45-minute workshop in which participants were challenged to use the prompts to develop new solutions in hypothetical HC scenarios. The pilot served as a dress rehearsal for the real thing (Robson & McCartan, 2016), enabling evaluation of both the perceived usefulness of the prompts, their usability, and the workshop format through which they are applied, including the participant instructions. Modifications were incorporated prior to application in the three cases.

C1 was a US-based medical association with several thousand members. Session participants were seven executives representing different departments and roles from management to event design. The overall objective of C1 was to create

value for members of the association by improving their HC experience. The prompts were intended to support the critical evaluation of current and past HC activities while also supporting the generation of implementable HC solutions to address specific challenge and opportunity areas. C2 was a team completing a design project at a UK university. This session was attended by eight participants, comprising trained designers, student representatives and faculty members. Their objective was to develop a 'cohort building' toolkit comprising implementable activities for improved HC across campus. C3 was a Netherlands-based creative leadership program with 700+ global alumni and a broad stakeholder network. This session was attended by the program's Director and the Global Head of Community. Their objectives were to improve their understanding of the effectiveness of their HC strategy and the HC experience of members and to identify the specific areas where HC activities would likely have the greatest positive impact. Our aims across the three cases were to determine the usefulness and usability of the prompts. That is, we sought to determine if the prompts were useful in supporting generative and evaluative design activities and were easy to use.

All sessions were conducted virtually using the Zoom video conferencing platform (www.zoom.us). Sessions were supported using either Miro (www.miro.com) (Pilot, C2, C3) or Mural (www.mural.co) (C1) online collaborative whiteboard platforms. The use of these platforms enabled participants to collaborate remotely in real time. Sessions were of mixed duration, either 60 minutes (C1 and C3) or 90 minutes (C2). C2 and C3 comprised one design session whereas in C1 two sessions were conducted approximately 1 month apart. The two sessions in C1 provided a unique opportunity to apply the design prompts with the same group in two different ways.

The exercise in all three cases followed a similar structure, consisting of four or five steps supported by a visual template (Figure 19). Following a verbal introduction to the design prompts, participants worked individually or in small groups. Their first task was to select a limited number of prompts they believed were most relevant in their context. Selected prompts were dragged onto the template (see '1'). Next, participants were asked to articulate specific challenges or opportunities relating to their selected design prompts. These were entered on the sticky notes provided (see

'2'). The third step was to generate solution ideas that addressed the challenges or leveraged the opportunities identified in the previous step and type these on the sticky notes provided (see '3'). In the fourth step, participants were asked to select one solution idea they felt was actionable and would have the biggest impact achieving their specific HC objectives. The selected solution idea sticky note was dragged to the area provided (see '4'). Finally, where time permitted, in the fifth step, participants were encouraged to think more deeply about their selected solution idea. In C1, these were worked out in concept canvases. In C3 (illustrated in Figure 19), participants were asked to list four things relating to their selected solution idea, namely: benefits for individuals, benefits for the organisation, how success would be measured, and potential barriers.
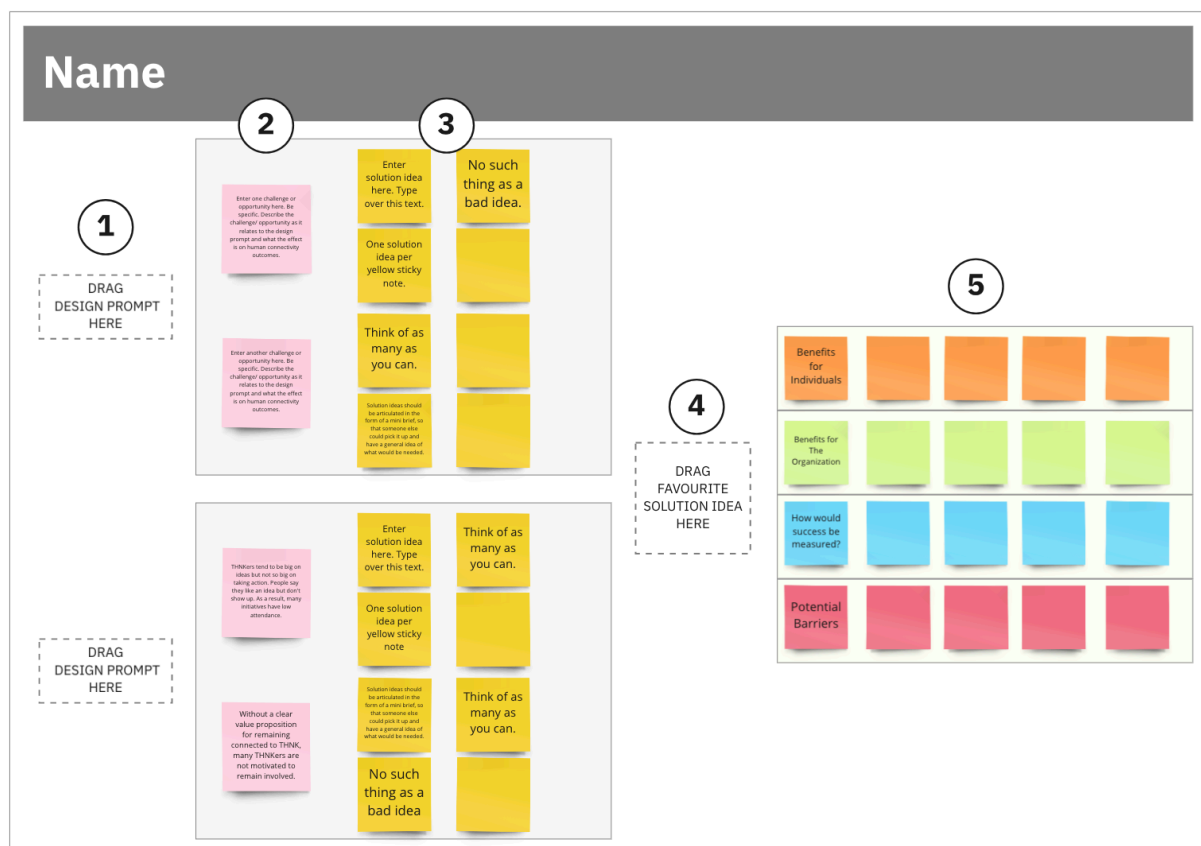
Figure 19: Illustration of workshop steps in C3

In steps 2 and 3, guidance was provided by way of instructions and tips on the sticky notes. For step 2, the guidance read "Enter one challenge or opportunity here. Be specific. Describe the challenge/ opportunity as it relates to the design prompt and how it affects HC outcomes." For step '3', each sticky note contained a separate

instruction or tip as follows: "Enter solution idea here. Type over this text"; "One solution idea per yellow sticky note"; "Think of as many as you can"; "Solution ideas should be articulated in the form of a mini brief, so that someone else could pick it up and have a general idea of what would be needed"; "No such thing as a bad idea."

6.6. Learnings from application of the prompts

Application of the prompts in the three case studies generated a range of useful learnings that supported continuous iteration, both of the content of the prompts and how the prompts were implemented. Reflecting our objectives specified earlier, here learnings are organised according to: *usefulness* – referring to how useful the prompts are in supporting generative and evaluative DfHC activities in creative and collaborative ways; and, *usability* – referring to how easy or intuitive the prompts are to use.

6.6.1. Prompt usefulness

The usefulness of the prompts was evident across all three cases. Participants reported that the design prompts (which some referred to as "the As") provoked new thinking or helped *structure* and *focus* thinking. For example, one participant from C1 noted "My favourite part of the workshop was working with the "As" because it fostered deeper reflection about what we might do and why." When asked what they liked about the prompts, two participants from C2 noted "I like that it adds structure to our thinking" and "[Having] specific prompts provides structure." Two participants from C1 made the following comments: "Identifying a specific question and then finding solutions gave us some actionable takeaways", and "The design prompts exercise was an opportunity to think specifically instead of broadly and gave us what can become actionable items."

These comments reflect a general observation in DfHC that designers and practitioners often take broad approaches to understanding and addressing HC challenges, thus making it difficult to achieve measurable change. Broad, immeasurable objectives such as "We want to help our team to get better connected" are common, where it is not always clear who exactly is being targeted and what "better connected" means. Feedback received through application of the design

prompts validates the value of more specifically identifying the critical elements (i.e., the prompts) that influence HC outcomes. The additional level of specificity provided by the prompts clearly supported participating designers and practitioners in being more deliberate and focused in their approach to DfHC.

Usefulness may also be considered in terms of the generalisability of the prompts. When the prompts can support generative and evaluative design activities (i.e., activity-based generalisability) and when they can support designers and practitioners in a broader range of contexts (i.e., context-based generalisability) we can say that they are more useful. Feedback from participants in all three cases supports the generalisability of the prompts in both ways. Support for the activity-based generalisability of the prompts is perhaps best summarised by a participant from C1: "I think the A's are a great tool for our team to use to discuss future and current activities and ways to improve." The reference to "future activities" indicates the prompts can support generative design activities. The reference to "current activities" indicates the prompts can support evaluative design activities. In a similar vein, a participant from C3 shared "Very useful, if only to validate some of the thinking we've already done."

Regarding context-based generalisability, participants across all cases saw potential for the design prompts in a variety of contexts. Having already confirmed the usefulness of the prompts for addressing HC challenges in three unique contexts (i.e., a medical network, a university cohort and a global leadership alumni), other examples included: C2: "This framework could be used in a collaborative workshop or co-design workshop", "In a start-up, especially quickly growing ones, to make sure everyone is comfortable, and we have a great [social] dynamic", "Designing experiences - including any experience where there is human interaction", and C3: "A great gap assessment tool", and "Great for ideation."

These comments from participants, in combination with observations across the three cases, also provide confidence regarding the usefulness of the prompts in meeting the requirements for a tool as specified in section 6.2 – namely that the tool should support *creativity* and *collaboration* in DfHC activities. The prompts clearly supported collaboration as participants were able to rally around ideas, confident that they were talking about the same things. Participants could move between sub-groups

in the workshops and quickly get up to speed with a challenge or opportunity such that they could then make a valuable contribution. The way the prompts supported creativity was evident in the broad range of specific HC challenges participants were able to articulate. A selection of these challenges is presented in Table 16.

Table 16: Examples of the prompts manifesting across the three cases

Prompt	Example Challenge or Opportunity from Case Studies
Ability	[C2] Many students feel they lack the ability to strike up meaningful conversations with strangers (i.e., others on campus). They don't know what to say.
Apathy	[C1] Members are so focused on learning new knowledge and finding career opportunities, they are not motivated to make new connections. It's not always clear to them what they'll get out of a seemingly random connection.
Apprehension	[C2] Students are often apprehensive about making the wrong first impression as they attempt to join or create new social circles.
Attitude	[C1] Networking is perceived as a "to-do" item that is obligatory rather than as an opportunity. Many people loathe traditional networking.
Abundance	[C3] As the alumni community has grown, it has become impossible for members to stay connected. It can be overwhelming to navigate the network.
Affinity	[C2] Students judge each other and determine whether they like someone at face value (first impression) which can often be negative. They miss out on great opportunities.
Applicability	[C1] Members tend to seek out others working in the same specialty area. People are defined by their role or job title so if someone is not working in the same area, they're seen as less relevant.
Asymmetry	[C2] Local students feel that they have all the local knowledge and therefore have more to give than visiting/foreign students.
Authenticity	[C2] Many students have a tendency of behaving according to stereotypical roles based on who they think they're supposed to be, rather than just being their true selves.
Authority	[C1] Junior members can feel intimidated when seeking to connect to senior members. Because senior members are celebritised, all members prioritise connecting with them when a junior member may derive more value from connecting with a peer.
Availability	[C3] Because of time differences, it's difficult to get people in the same place at the same time.
Awareness	[C3] The alumni directory is out of date and new programs are being added all the time. It's become almost impossible to know who else is in the community.

Accessibility	[C1] Everything we do has traditionally been U.S. (and English-language) centric. As we seek to attract international members, they face obvious barriers to access.
Aids	[C1] The opportunities to connect are not always well communicated to participants. We could do more to make this explicit and also provide helpful prompts and nudges.
Appropriateness	[C2] There is huge diversity across the alumni - culturally, demographically, and professionally. It's not always clear what the most appropriate behaviour is in a given situation.
Architecture	[C1] Some of the main meetings are huge with thousands of participants. There is a constant balance between facilitating the flow of people quickly from one space to another with creating spaces where people can slow down and meet.
Assessment	[C3] We conduct many activities intended to help the alumni to connect but we generally never have a pre-defined measure of success.
Assistance	[C3] Being at the centre of the network, we are in the best position to broker connections but as the alumni grows, personal introductions are no longer feasible. We need to make this scalable.
Atmosphere	[C1] There is an unnecessarily formal tone to the way we design and communicate our meetings which makes it difficult to encourage participants to relax and have fun.

6.6.2. Prompt usability

Next to determining the usefulness of the prompts, we were also interested in understanding how usable the prompts were. That is, did participants find the prompts to be intuitive and easy to use? In introducing and setting up each workshop, we sought to provide sufficient guidance that participants would reach satisfying outcomes without over-constraining use. Applying the prompts in three different cases allowed for the manipulation of how the prompts were presented as well as unique application contexts.

Overall, participants found the prompts intuitive and easy to use. Once the prompts were presented, participants immediately perceived their relevance and were able to get straight to work. Participants were also satisfied with the way the workshop exercise was designed and delivered as summarised by one designer from C3: "Clear instructions. Well laid out. I know exactly what I need to do in each step.", and a practitioner from C1: "Well organised. As a program manager I appreciate."

One interesting learning regarding prompt-usability related to the effect of categorising the prompts. Initially, prompt categories were emphasised. The prompts were presented as Connector-, Contact-, and Context-related. In applying the prompts in the pilot however, categories were found to be a distraction. Participants wasted time discussing to which category a HC challenge belonged with no perceptible influence on outcomes. Following the pilot, less emphasis was made of the prompt categories so as not to unnecessarily distract participants.

A second learning related to the number of prompts that participants should work with at any one time. In the pilot, the first session with C1, and in C2, the total set of prompts was randomly divided between subgroups of participants so each person only had to consider a limited number of prompts. This was intended to minimise overwhelm (i.e., focus participants on a smaller set of prompts), and to encourage participants to work with different prompts. Feedback from participants indicated they would rather be given the full set of prompts from which to choose, so for C3 and the second session with C1 all prompts were available to all participants. Ironically, participants reported that this made selection easier as they did not have to compromise (e.g., having decided in the introduction which prompt they would select but then not being given that one in their randomly allocated set).

6.7. Discussion

The objective of this chapter was to develop a tool to support DfHC, particularly around the scoping of HC challenges and the evaluation of HC outcomes. In achieving this objective, we build on earlier chapters and turn a corner from what has been a predominantly descriptive research narrative to a prescriptive one. We conduct in-depth interviews to deepen our understanding of the HC experience in contemporary work situations and through an iterative process of coding, framing, grounding, and refining through application, we conclude with a set of 19 design prompts. The prompts meet their prescribed requirements of supporting both creativity and collaboration in DfHC activities. Successful application of the prompts in three case studies provides confidence as to their usefulness and usability as well as their generalisability to other contexts. The prompts helped participants (both designers

and practitioners) by structuring activities and by provoking thinking beyond the obvious.

Our organisation of the prompts into three categories (i.e., Connector-, Contact- and Context-related) has important implications for design as it supports designers and practitioners in making a clear distinction between the human (e.g., mindset, skills, and other attributes) and contextual (e.g., environmental, technological, societal) aspects of a design that may influence HC outcomes. Connector-related prompts may be understood by only considering one individual, whereas Contact-related prompts are only understood when considering a dyad and Context-related prompts are only understood when people are situated in a specific setting. This aligns with the behaviour setting research presented in chapter 5 which also helped distinguish between the human (i.e., people), non-human and contextual (i.e., props, infrastructure, and stage) elements of a setting in explaining HC outcomes. Categorisation of the prompts should be optional dependent on the context in which they are used. In some cases (e.g., for some research purposes or when seeking to focus on a specific challenge area), it may make sense to emphasise the differences between the categories and use prompts from just one category. In other cases, as was discovered in the three cases studied, participants fare best when they can consider all prompts equally, regardless of their category.

Distinguishing between the objectives, activities, and experience of the Connector and the Contact makes it possible to identify the role-critical attributes a person must possess to enact each role successfully. This then supports our understanding of how these attributes may help or hinder the HC process and aligns with the behaviour setting research presented in chapter 5. Differentiating the role of the Connector from that of the Contact requires taking a specific person's perspective and thus lends itself to a human-centred design approach which is currently surprisingly lacking from much HC-related research. While this distinction between the three categories of prompts matters for design research, as the added nuance provided by the categories helps to build different areas of focus, we found it not to be important for the application of the prompts.

This work has implications for the point made in chapter 2 that HC challenges appear to be becoming increasingly complex, driven by a range of trends influencing

the way people live and work. While all prompts were seen to be at least partially relevant in the contexts studied, we would expect that in different contexts the respective relevance of prompts may be relatively greater or lesser. For example, the *availability* prompt is likely to be increasingly relevant in some organisations due to the increased prevalence of hybrid work models. Because people are spending less time in the same (office) space, they are less available to connect in person. Related to the design cycles framework presented in chapter 2, relevance of a particular prompt will change depending on the way a design challenge is framed. For example, the *abundance* prompt implies the challenge of connecting in large groups so this is likely to be less relevant in small group contexts such as a person joining a small team. A clear articulation of the context and the specific challenge is therefore likely to assist in the selection of the most relevant prompts.

In the three cases studied, the activity of selecting a limited number of prompts was designed to encourage session participants to focus on a manageable number of challenge or opportunity areas given the time constraints of the sessions. Selection of some prompts did not necessarily mean that other prompts were not relevant. Rather, selected prompts were simply seen as more relevant though it is worth noting that in all cases the prompts led to important discussions and insights not previously considered by participants. This reflects the earlier mentioned tendency of designers and practitioners reverting to drawing broad conclusions and implementing safe solutions and shows how, true to their original intent, the prompts are useful in spurring discussion beyond the obvious.

Additional insights might be gained by considering the phase of the HC process, as presented in chapter 3. For example, we would anticipate *abundance* to influence the finding and maintaining phases in different ways. In the finding phase, *abundance* relates to the number of potential contacts a Connector has to select from. Design solutions may focus on facilitating the search process through filtering for the most relevant potential contacts. In the maintaining phase, *abundance* relates to the number of existing contacts a Connector wishes, needs, or is able to keep sufficiently formed. Solutions here may focus on automating communications to support a Connector in effectively maintaining a greater number of contacts. Another solution may support a Connector in disconnecting from some contacts to minimise the

negative impact of *abundance*. A rigorous analysis of all prompts across all phases would reveal a comprehensive set of considerations that would support the creative precision of generative design activities and analytical precision of evaluative ones.

The prompts are intentionally flexible to support different use contexts (e.g., more time, larger groups). For example, in addition to selecting a subset of seemingly relevant prompts, designers and practitioners might instead sort all the prompts into priority order and discuss the effect of each prompt on HC challenges and opportunities. Alternatively, designers and practitioners might be randomly assigned prompts or select prompts blindly and be encouraged to identify challenges or opportunities they otherwise may not have considered. Other ideas may be generated by seeking to group prompts together and consider the interplay between them (including using the existing groupings).

Such flexibility helps to ensure the prompts can be used in a broad set of use contexts. Randomisation and other spontaneous forms of prompt sorting and allocation to participants will be likely be supported through the creation of a physical card deck with each prompt being represented on an individual card. This will enable the cards to be shuffled and dealt for example. Because the current research was conducted during the COVID-19 pandemic, in-person sessions were not possible. In-person application with a physical version of the prompts would generate new insights regarding their usability.

In this work, it was not our intention to guarantee an exhaustive set of prompts. Rather, we sought to derive and understand a foundational set of prompts that could be immediately implemented by designers and practitioners and that would stimulate discussion of these prompts and the exploration of others. It is likely that more prompts may be discovered and added to this initial set. Although we successfully applied the prompts in three unique cases with strong positive feedback, further testing would provide additional support as to their external and ecological validity. For the design prompts to have maximum impact in supporting designers and practitioners at scale, they would ideally be able to be used unaided rather than with in-person instruction. To achieve this, instructional material would need to be produced and tested.

6.8. Conclusion

The work presented in this chapter further advances DfHC research through the introduction of 19 design prompts that can support designers and practitioners in generative and evaluative DfHC activities, enhancing both creativity and collaboration. The positive feedback received from designers and practitioners in all three cases supports the usefulness and usability of the design prompts. Feedback and observations regarding the successful implementation of the prompts in all three cases also provides confidence as to the prompts' generalisability across contexts. Extant literatures ground the prompts in a wider evidence base upon which one may draw to explore the mechanisms behind the prompts. Further support is provided by insights from previous research, as presented in prior chapters, that supported the explanation of the mechanisms behind the prompts.

In addition to the contribution of new knowledge made in this chapter (i.e., the factors that influence the HC process in contemporary work situations and 19 design prompts to support DfHC) this work also represents a partial synthesis of key outputs from the preceding chapters. Applicability of the prompts and understanding of the mechanisms that explain them is revealed by considering insights from the previous studies. That the design prompts are supported by the earlier work provides additional confidence as to their relevance and generalisability across contexts.

The 19 design prompts provide much needed structure to HC design activities, both generative and evaluative, thus furthering the formalisation of DfHC. In the discussion chapter that follows, the interconnections between the chapters are explored and synthesised in more detail.

7.   Discussion and conclusions

We are an essentially social species; no component of our civilization would be possible without large-scale collective behavior."

(Adolphs, 2009, p. 694)

This thesis has outlined the growing volume and complexity of HC challenges in society and organisations, with a particular focus on contemporary work situations. To effectively address these challenges, we argue for the formalisation of Design for Human Connectivity (DfHC) as a distinct field of design research and practice. To begin this formalisation, we have introduced a structure to frame DfHC as well as several research outputs that address critical gaps in this exciting but underexplored field of design research and practice. Specifically, in addition to a DfHC framework bridging the HC knowledge base and HC environment, key outputs of this work include: A new HC process framework, tactics for Finding new contacts, articulation of individual, social, and contextual elements that influence HC outcomes, and a set of 19 design prompts which have been successfully applied in supporting generative and evaluative HC design activities in the field. Together, these contributions help to support designers and practitioners in the positioning of HC, the scoping of HC challenges, the generation of new interventions, and the evaluation of existing ones.

Within the contemporary work situations explored throughout the thesis, the need for solutions to increasingly complex HC challenges is arguably growing. In contemporary work situations there is variability in where, when, how, and with whom work is done. Contemporary work situations are characterised by unfamiliarity of people and context. Experimental 'smart' workplaces, coworking spaces, and multidisciplinary business conferences are just three examples of contemporary work situations, of which there are of course many more (e.g., hybrid work, freelance/gig-based work). From a HC perspective, these all represent extreme cases (Eisenhardt, 1989), where people and organisations are balancing seemingly incompatible objectives. For example, people are increasingly distributed, working remotely, or according to hybrid work models (e.g., working from home some days and at the office other days) (Gratton, 2021), yet the full benefits of HC generally require that

people spend sufficient time together for trust to be established (Abrams et al., 2003) and unstructured knowledge exchange to occur (Parrino, 2015). People are also increasingly working in fluid teams which form around projects and disband on project completion (Volini et al., 2019) yet the social and operational nature of such teams (e.g., short duration and interchangeable roles) limit people's ability to form strong connections with others (Hadley & Mortensen, 2021). And, as a final example, there is often an incompatibility between the push for diversity as a driver of innovation (Rocio & Reeves, 2018) and people's willingness to engage with and treat equally those who are different (Tajfel et al., 1971).

As the prevalence of contemporary work situations increases, driven by globalisation, changing market conditions and a continued push for productivity, it is fair to assume that related HC challenges are also likely to increase. Here we propose that by better understanding these situations and the factors that influence the HC process, design can play an important role in addressing the HC challenges that negatively impact the experience and performance of people within them.

Our review of the knowledge base (chapter 2) reveals substantial depth and breadth of existing HC-related knowledge, however little has been done in terms of developing a systematic way to apply this knowledge to improve the HC process. This is reflected in design research where HC frequently appears as a design input – for example, in experience design (e.g., Hassenzahl et al., 2013), product design (Holtzblatt, 2011), systemic design (van der Bijl-Brouwer & Malcolm, 2020), the design of resilient communities (Manzini & Thorpe, 2018), and the design of relational services (Cipolla & Manzini, 2009) – but the role design can play in supporting people through the HC process is yet to be formalised. Research that supports understanding of the HC process (i.e., the process through which HC outcomes are attained) is generally lacking or is not suited to supporting design activities. There exist many practical design examples of interventions intended to improve HC outcomes although these tend to be speculative and are not always grounded in the knowledge base. In practice, designers and practitioners appear to lack the awareness and the tools to consider the HC consequences of the pursuit of other organisational objectives (e.g., performance optimisation).

A key assertion of this work is that the current lack of specificity in the way HC challenges are scoped makes them difficult to address through design. Designers and practitioners tend to scope HC challenges and respective objectives in broad, holistic terms (e.g., "break down silos", "get everyone on the same page", "socialise new team members"). Such scoping can lead to equally broad and universal solutions such as "happy hours", "away-days", and "networking events" that have become institutionalised and are often implemented with little deliberation regarding their specific purpose (Coburn, 2016). In addition, such solutions have become so ubiquitous and formulaic that there is a general perception that one such event is the same as the next. This affects not only the way these events are experienced by participants (an experience which is generally negative, e.g., Casciaro et al., 2016) but also how they are designed (i.e., according to a universal template that includes beverages, nibbles, name badges, activities, and so on). Supporting designers and practitioners in more critically understanding and thus scoping HC challenges will not only facilitate the selection of appropriate categories of solutions, but also the design and evaluation of those solutions.

Together, this indicates a substantial opportunity to take a design-led approach to improving the HC process as a means of addressing critical HC challenges, and improving HC outcomes in doing so. Achieving this aim requires a systematic, structured, and holistic approach to DfHC. The rigour inherent in such an approach to DfHC will also support the generation of new knowledge, generalisable across contexts. In addition, a shift to improved HC process understanding and related support will drive better HC outcomes and provide a basis upon which the pursuit of HC outcomes can be compared and learned from. It is in the development of HC process and design support that design research and practice can play a leading role.

Through this work, we provide multiple supports to improve the articulation, scoping, and addressing of HC challenges in contemporary work situations. As highlighted above, in addition to 19 design prompts, these supports include a HC process framework that helps specify phase-level objectives and requirements; a definitive list of Finding tactics that helps deriving and improving the tactics available for initiating connections; and the derivation and articulating of personal and contextual elements that can help or hinder the HC process. This work has important

implications for designers and practitioners who, currently lacking such nuanced understanding, often treat HC challenges in isolation from their broader context and/or rely on past experience, intuition, and anecdotal evidence when selecting or designing solutions to address them.

7.1. Formalising DfHC

The design cycles framework (chapter 2) (Hevner, 2007) provides a useful structure for the formalisation of DfHC, with generative and evaluative design activities acting as a bridge between a continually changing HC environment and a growing HC knowledge base. This framework highlights a need to better scope HC challenges, thus enabling the creation of accurate and specific HC design briefs and improving the potential of effectively evaluating a design's efficacy. On the other side of this framework, structuring the knowledge base to better support HC-related design activities will have the dual benefits of grounding design activities in the knowledge base and improving their rigour, thus increasing the potential for outcomes from such activities to make valuable knowledge contributions.

Reframing the HC process as a journey (chapter 3), akin to a user- or customer-journey, addresses the tendency of prior work to either focus exclusively on HC outcomes or to take a snapshot view of HC challenges thus failing to contextualise challenges relative to the phase of the HC process in which they occur. Our Connector-centric deconstruction of the HC process into distinct activity-based phases helps to identify and communicate a person's objective(s) in each phase, thus supporting scoping of HC challenges according to what a person is seeking to achieve, not just overall, but at the phase level. Design interventions may now be more accurately targeted at addressing HC challenges specific to a phase in the process.

While such a phase-level deconstruction is useful in itself, a deeper understanding of each phase adds further support to the scoping of HC challenges and the generation and evaluation of design interventions. This is exemplified through our interrogation of the Finding phase (chapter 4), a connectivity phase which prior work tends to overlook or bundle into a general kick-off phase described broadly as "initiation" (e.g., Knapp, 1978; Kram, 1983) or similar. Here we introduce five distinct tactics a person can adopt in finding others to connect to. These unique

routes to Finding acknowledge the limited number of approaches people can adopt in satisfying their respective phase-level objective. This then supports scoping HC challenges not just at the phase level but also in terms of the tactics currently supported (or not), and the effectiveness of people in utilising the different tactics. The improved depth of understanding of the HC process, achieved through the interrogation of the Finding phase, alludes to the additional knowledge that may be gained through a deeper understanding of the other phases.

While the previously described chapters highlight the role of the HC process in driving HC outcomes, usefully deconstruct the process into distinct phases, and begin further interrogation of those phases, a nuanced understanding of the factors that influence the HC process is thus far lacking. This is provided in chapters 5 and 6 by the work grounded in behaviour setting theory, the barriers and enablers to human connectivity, and the design prompts. Together, this work presents the individual, social, and contextual factors (e.g., props and features inherent to the infrastructure of a setting) that can help and hinder the HC process in contemporary work situations. This added degree of specificity supports scoping HC challenges and evaluating outcomes according to specific attributes of a person or other element in a setting and the role they play in supporting or hindering the HC process.

A goal for any design research should be to conduct itself with rigour, by being grounded the existing knowledge base. Such a grounding facilitates the contribution of new knowledge to the knowledge base. The prior lack of recognition of DfHC as a distinct field of design research and practice and the lack of structure guiding such activities has previously made this difficult. The structure introduced through the new HC process framework (i.e., the Connector's Journey) and the Finding tactics – in combination with the barriers and enablers, behaviour settings elements, and their manifestation in the design prompts – together provide an approach to organising the knowledge base that is better suited to support design. Together, this work provides designers and practitioners with a clear list of elements, features, and attributes – organised according to individuals, groups, and the broader context – that can influence the HC process and thus outcomes. Such organisation makes the volumes of existing knowledge more readily accessible and, as was observed through the

application of the design prompts in the field, more able to provoke new thinking beyond the obvious.

7.2. Implications for design and practice

This thesis has implications for designers and practitioners, including those who identify as professional designers and researchers and those who, as a function of their role in an organisation, engage in design-related activities that "seek to change existing situations into preferred ones" (Simon, 1996, p. 111). In organisations, such roles may be senior as well as junior and may occur in a broad range of functions from HR to operations and business development to innovation. Such individuals may be those seeking to understand the strategic importance of HC in enhancing organisational and team performance, employee wellbeing, creativity, innovation, and more. They may equally be specialists such as event organisers and organisational designers who design experiences, systems, and services that rely on strong human connections or that specifically seek to improve HC outcomes. Implications for designers and practitioners can be considered at three levels which we refer to as policy, principles, and practice. Here we present the implications of this work according to these three levels.

7.2.1. Policy-level implications

Policy-level implications relate to the grounding, structuring, and framing of strategic thinking as it relates to HC. For designers, an important policy-level implication of this work is its elevation of HC as distinct field of design research and practice. Where HC is currently mostly included as *input* into other design activities, here we make the case for HC as a *focus* of design, including its consideration in the early stages of the design process even when improving HC is not a core design objective.

Recognising HC as a distinct field of design research and practice creates space for a wave of design research that supports DfHC's continued formalisation and growth. Design is well placed to address the increasingly prevalent and complex HC challenges faced by people in professional as well as personal contexts. Doing so, however, requires a structured approach that facilitates a more nuanced understanding of HC challenges, and a more systematic approach to the application

of the knowledge base to addressing those challenges. This thesis provides such nuance and structure although much more is needed. The research questions posed in chapter 2 provide a starting point for this continued work.

A second policy-level implication for design, also facilitated by the elevation of HC as a design priority, is the need to consider HC earlier in the design process. This is important not only for design activities where "improving HC outcomes" is an explicit objective, but also in those activities where the pursuit of other design objectives (e.g., performance optimisation in organisations) can unintentionally deliver detrimental HC outcomes. A useful analogy here is the way sustainability now commonly features as a key consideration in product design (Ceschin & Gaziulusoy, 2016). Even when not designing *for* sustainability, the universally accepted importance of sustainability now influences design decisions for all manner of products, services, systems, and more. In much the same way, this work highlights the importance of HC and proposes HC as a key consideration in a range of design activities where it is not currently considered. As our exploration of HC as an unintended consequence of design (chapter 2) highlighted, when the HC implications of other design decisions or objectives (e.g., optimisation) are not considered, the HC outcomes can be unintentionally negative. This is exemplified by many organisations' shift to hybrid work models and distributed teamwork, where economic or performance gains may be realised but people lose their sense of connectedness with colleagues.

For organisations, policy-level implications relate to the way HC is understood and positioned. The socio-technical nature of many contemporary organisational systems means that people, and the connections between them, are critical to the performance of functions across the organisation (Bentley et al., 2020). This indicates the importance of considering HC not just at a departmental level (e.g., "HC is an HR function"), or an activity level (e.g., "HC is important in onboarding processes and networking events"), but also at a strategic level (e.g., "HC is embedded in and contributes to the wellbeing of people and organisation's culture and overall performance"). A useful analogy here is the way innovation, which in the past was often seen as residing in a separate department, now forms an integral part of the culture of many organisations (Pisano, 2019). In line with the design implication

above, where HC should be considered early in the design process, taking a more holistic approach to HC at a policy level within organisations will help ensure opportunities are not missed and unintended HC challenges are not inadvertently created through the blind pursuit of other organisational objectives.

Encouragingly, there are strong signs indicating a movement in this direction, where the strategic importance of HC is increasingly acknowledged at the highest levels in organisations. Perhaps the strongest indicator of this is the rise of ESG (Environmental, Social, Governance) factors supplementing financial factors in guiding investment decisions (United Nations, 2004). Human connectivity sits at the core of the "S" in ESG. Such a trend points to an organisational desire to improve HC, as a means of delivering social outcomes and improving an organisation's perceived value. However, like HC in general, much work to date has generally been *outcome-focused* (i.e., highlighting the importance of the social outcomes of organisational decision making) rather than *process-focused* (i.e., how to achieve those outcomes). This thesis supports a shift toward a process-focused approach to HC and thus has implications in the guidance it offers at the policy level.

7.2.2. Principle-level implications

Principle-level implications relate to the provision of "design process guidance to increase the chance of reaching a successful solution" (Fu et al., 2016, pp. 101103–3). Providing such principle-level guidance is the focus of this thesis, most notably in the way it supports a more structured and systematic approach to DfHC.

An important principle-level implication of this work is the support it provides, not only for design*ers* in the traditional/professional sense, but also the many people in organisations who are currently design*ing* solutions to HC challenges, from organisational designers to meeting planners. The outputs of this work can act as boundary-type objects to facilitate communication and collaboration in a broad range of HC-related design activities. HC-related communication among designers and practitioners is supported by the common vocabulary this work provides. This enables designers and practitioners to more accurately and consistently articulate HC challenges and describe the HC process (i.e., the Connector's Journey), and specify factors that may positively or negatively influence that process (i.e., the design

prompts). The consistency and structure this common language provides can also support the categorisation and organisation of HC-related design research. This helps to address the current fragmented and disconnected nature of much related work.

A second important principle-level implication of this work is its adoption of a Connector-centric lens to frame HC challenges and DfHC activities. This supports better understanding of the needs of people as they seek to meet their HC objectives throughout the HC process. This contrasts with prior work that largely adopts a researcher-centred lens to explain what is happening in a relationship. Focusing on the objectives and activities of people as they navigate the HC process to address HC challenges or leverage opportunities is reflected in the vocabulary used to label HC process phases and the design prompts in a way that we propose is more intuitive to designers. For example, the labelling of each phase of the Connector's Journey describes what a person is doing (e.g., *Finding* someone to connect to), what their objective is (i.e., to *find* someone) and when the phase-level objective is achieved (i.e., a Contact is *found*).

A third principle-level implication of this work for design is its contextualisation of HC challenges in terms of both the general context in which challenges occur (i.e., the HC environment) and the phase of the connectivity journey they relate to. Framing HC challenges as such can help to focus on the actual problem at hand, thus supporting the generation of more accurate design briefs. The improved accuracy and specificity of such briefs not only serves to address the current ambiguity in the early stages of the HC design process, it also provides clear objectives against which the effectiveness of design outputs can be evaluated. Supporting evaluative design activities increases a designer's ability to determine if the solution has been successful in meeting its objectives.

The principle-level implications for practitioners reflect those outlined above. This work supports the many thousands of people within organisations who, previously lacking appropriate methods and tools, are often forced to "wing it" when it comes to designing and evaluating interventions, relying on past experience, personal preference, and anecdotal evidence to guide decision making. Managers are supported in identifying and understanding (i.e., scoping) HC challenges. They are also supported in communicating such challenges with those tasked with designing

solutions to address them. The collection of design supports presented in this thesis support practitioners by providing them with methods and tools to more effectively scope, ground, generate, and evaluate interventions.

Overall, this work supports an *informed* approach to DfHC rather than the current *intuitive* approach. It supports designers and practitioners in scoping HC challenges, articulating HC briefs, and evaluating HC design outcomes, both during the design cycle and when applied in the field. The various contributions of this thesis, not least the Connector's Journey and the 19 design prompts, provide a consistent and design-friendly vocabulary and set of supports that can facilitate creative and collaborative design processes.

7.2.3. Practice-level implications

Practice-level implications relate to the tactical design and implementation of specific interventions. Although designing and implementing bespoke solutions to address HC challenges was outside the scope of this work, ongoing collaboration with one of the multidisciplinary conferences included in the behaviour settings research (chapter 5) provided an opportunity to co-design practical solutions for implementation in the following year's edition of the conference. Practice-level activity was also observed in the workshops in which the 19 design prompts were applied and refined. Together, these opportunities highlighted practice-level implications of the current work.

The outputs of this work can guide the selection and tactical design of solutions to specific HC challenges. As highlighted throughout this thesis, often unsupported, designers and practitioners tend to revert to tried and trusted solutions (e.g., networking events) to address HC challenges. Having a deeper and more nuanced understanding of the HC process and influential elements in a setting, practitioners in the cases mentioned above seemed more confident in their selection of solutions and respective features. In addition, practitioners appeared to be more creative and playful in their approach, suggesting that the support provided by this work provoked new thinking beyond the obvious.

This work also had practical evaluative implications for practitioners who again seemed confident in their ability to scrutinise existing design solutions and related decisions. Justifying design decisions is supported by their grounding in the

various research outputs (e.g., a decision to focus on a specific phase of the Connector's Journey). Similarly, when reflecting on prior outcomes to inspire the selection or design of new solutions, practitioners' explanations for success and failure could be usefully grounded in the various research outputs (e.g., explaining a failure due to a previously overlooked element). Again, it should be stressed that such observations did not form an official part of the current research and were limited to two cases. That said, such observations do suggest valuable practice-level implications of this work for designers and practitioners alike.

7.3. Ethical considerations for design research and practice

Design for human connectivity inherently involves supporting or otherwise influencing the behaviour of people, either directly or indirectly. Whether intending to or not, the decisions of researchers, designers, and practitioners can have a marked impact on the experience and therefore potentially on the wellbeing of particpants and users (Sunstein, 2015). As such, it is important to identify and acknowledge the ethical considerations of DfHC as the field grows. Such considerations relate to design research as well as design practice and are relevant both in cases where HC outcomes are intentional or unintentional (Figure 20).

	Unintentional	Intentional
DfHC Practice	Design artefact created to meet other objective (e.g., efficiency) produces negative HC outcomes (e.g. people deprived of opportunities to connect)	Organisation deliberately limits peoples' opportunities to connect in attempt to achieve some other goal (e.g. staggered breaks to prevent socialising)
DfHC Research	Participation in research triggers participant to dwell on their lack of connections (i.e. highlights "social void" or sense of loneliness)	Allocation of participants to ingroups or outgroups in order to deliberately create competition leads to conflict.

Figure 20: Categorising ethical considerations in DfHC with examples

The *unintentional* outcomes of DfHC *practice* that may have ethical implications are introduced in chapter 2 and are also discussed earlier in this chapter. This relates to situations where the pursuit of other design objectives may have ethically questionable HC outcomes. For example, the move of many organisations to hybrid models of work may benefit the organisation (e.g., through cost savings) and some individuals (e.g., reducing or eliminating their commute) but may at the same time deprive some people of important social interactions that are critical to their sense of belonging. As discussed with Policy-level implications (section 7.2.1), such outcomes may be addressed by considering HC and potential HC outcomes earlier in the design process, even when 'improving HC outcomes' is not a primary objective of a design activity.

The *unintentional* outcomes of DfHC *research* that may have ethical implications relate, for example, to the potential psychological impact of asking study participants to reflect on their perceived sense of connectedness. As also highlighted in chapter 2, some authors make a distinction between a positive ("growth orientation") or negative ("deficit reduction) orientation of belonging where a growth orientation "leads one to connect with others while reflecting a genuine interest toward them" while a deficit-reduction orientation "leads to desire the closeness of others to fill a social void" (Lavigne et al., 2011, p. 1186). When participating in research increases the salience of this "social void" for participants, thus highlighting their lack of a fundamentally important sense of connectedness, the void, or at least the perception of a void, may be exacerbated. Mitigating such unintended effects requires the recognition of such potential outcomes and transparent communication with research participants to manage expectations.

The *intentional* outcomes of DfHC *practice* that may have ethical implications relate to design activities where an intentional decision is made to restrict or remove peoples' abilities to satisfy their HC needs in an attempt to serve another business objective. For example, an organisation may insist that certain members of a team take their breaks at different times to limit unnecessary socialisation and break overruns. While this may indeed improve productivity, employees general sense of belonging may suffer, thus increasing the perceived sense of social isolation and related outcomes. Another foreseeable situation is where an intervention intentionally

prioritises one type of stakeholder over others, thus restricting the HC opportunities of the other group(s). Where more inclusive solutions are not feasible (e.g. in some situations there must always be answering phones so not everyone can break at the same time) mitigating actions should be taken with the wellbeing of all stakeholders in mind. In this case, it may mean creating other opportunities for colleagues to socialise for example.

The *intentional* outcomes of DfHC *research* that may have ethical implications relate, for example, to design research activities where researchers deliberately challenge or otherwise limit participants' sense of connectedness in order to test certain hypotheses or collect a certain type of data. One example of this may be intentionally introducing ingroup and outgroup divides to create a sense of inter-group competition. While such research may provide valuable insights, it may also lead to conflict or have a negative psychological impact on some participants. Researchers must be aware of the ethics of these kinds of tradeoffs and must make all efforts to ensure the wellbeing of participants.

Addressing these potential ethical implications requires researchers and practitioners firstly be aware of them, and secondly be proactive in eliminating them or mitigating their effects. Awareness of ethical considerations will continue to rise as the DfHC domain grows. Practitioners and researchers alike have a responsibility to understand and communicate the implications of their work. Once aware, eliminating or mitigating negative outcomes requires guided direction. To this end, Table 17 provides a list of ethical considerations for DfHC adapted from Berdichevsky and Neuenschwander's (1999, p. 52) list of "Principles of Persuasive Technology Design". As is the case with persuasive technology, DfHC often seeks to create artefacts or other interventions that influence or change behaviour.

Table 17: Ethical Considerations for Design for Human Connectivity

1. The intended outcome of any DfHC activity should never be one that would be deemed unethical if the action were undertaken or the outcome occurred independently of the activity.
2. The motivations behind generative DfHC activities should never be such that they would be deemed unethical in any other context.
3. Designers and practitioners engaged in DfHC activities must consider, contend with, and assume responsibility for all reasonably predictable HC outcomes, whether they be the intended objective of the activity or a byproduct of the pursuit of another objective.
4. DfHC researchers, designers, and practitioners must ensure that the personal information and needs of participants (in the case of research) and users (in the cases of design and practice) are treated with at least as much respect as they regard their own information and needs, acknowledging that participant and user HC needs and experience may be markedly different to their own.
5. DfHC activities that require communicating or otherwise sharing personal information about a participant or user to a third party must be closely scrutinized for privacy concerns.
6. Those engaged in DfHC activities should disclose their motivations, methods, and intended outcomes, except when such disclosure would significantly undermine an otherwise ethical goal.
7. DfHC activities must not misinform or mislead in order to achieve their HC end.

Usefully, several of the design prompts (chapter 6) can also support a more ethical approach to DfHC. In much the same way as they aid designers and practitioners in thinking of solution ideas "beyond the obvious", the prompts can also support designers and practitioners in recognising where and how an intervention or design decision may have unintended consequences with ethical implications. *Apprehension,* for example, which highlights that many people are apprehensive about connecting to others, can provoke investigation regarding what the root of such feelings might be. While some sources of apprehension will be perfectly natural, others may stem from factors that are within the control of the researcher or designer to manipulate and therefore mitigate. Similarly, *Accessibility,* which provokes thinking about whether all relevant stakeholders have equal access to an intervention, can

provoke deeper consideration regarding aspects of an intervention that are potentially excluding some people.

The inherent complexity of HC and the uniqueness of the HC experience to each individual can make it challenging to identify and accommodate the specific needs of all participants and/or users in all situations. Engaging in different studies and interventions will affect different participants and users in different ways. This can make it challenging for researchers, designers, and practitioners to effectively address all unintentional outcomes. That said, DfHC activities require a thoughtful, deliberate, and ethical approach grounded in reasonable awareness of outcomes and practice guided by the considerations in Table 17.

7.4. Contributions

This work makes six main contributions, summarised in Table 18 and further described below.

Table 18: The contributions of this thesis

Contribution	Chapter	Description	Outcome / Value
Formalisation of DfHC	2	A framework, and related supports and vocabulary, that situates DfHC between the HC environment and the knowledge base.	Distinguishes HC as a distinct field of design research and practice and provides structure for the formalisation of this field.
Unfamiliarity matrix	2	A 2x2 matrix that positions organisational situations according to the degree of familiarity people feel toward others and the general work context.	Recognises key drivers of HC challenges (i.e., unfamiliar people and unfamiliar contexts) as a way of categorising work situations according to four distinct types.
The Connector's Journey	3	A 5-phase HC process framework.	Deconstructs the HC process through the lens of the Connector and according to their needs, objectives, and related activities.

Five 'Finding' tactics	4	The tactics people may adopt in finding others to connect to.	Articulates the possible ways that a person may *find* others to connect to and specifies the requirements of each tactic.
Behaviour Setting Canvas	5	A structured tool for visualising relevant elements of a behaviour setting.	Organises, summarises and communicates the elements of a behaviour setting in a design-friendly and comprehensive way such that elements may be analysed and manipulated to predict and explain behaviour.
19 DfHC design prompts	6	A HC design support comprising 19 prompts that designers should consider in generating new HC solutions or evaluating existing ones.	Supports creativity by provoking thinking beyond the obvious in both generative and evaluative HC design activities; Prompts act as boundary-type objects to aid communication and collaboration.

Formalising DfHC

An important overall contribution of this thesis is its recognition, elevation, and structuring of DfHC as a distinct field of design research and practice. Until now, HC-related research and practice has generally been embedded in other domains and, as such, has been seen as an *input to* rather than a *focus of* design. This has stifled its development and ensured the fragmentation of knowledge, exacerbated by inconsistencies in the way HC-related research and design activities were communicated. Formalising DfHC as a distinct activity acknowledges the volumes of invaluable research that support understanding of HC and ensures requisite rigour in HC design (research) activities while creating opportunities to develop DfHC in new and exciting ways.

Unfamiliarity matrix

The "unfamiliarity matrix" plots organisational situations according to the familiarity of people and context – two key influencers of the HC process and outcomes. This matrix, created to help position and focus the current research, also provides a useful

way for designers and practitioners to categorise organisational situations and in doing so anticipate the types of HC challenges and opportunities each situation may present.

The Connector's Journey

Through an abductive process of synthesis and sense making, combining a snowballing literature review, observation, and years of professional experience, a new connector-centric, activity-based, and objective-focused HC process framework is introduced. The Connector's Journey comprises five phases that map the journey of a connection from the perspective of the protagonist in a connecting dyad – the Connector. The five phases are Finding, (trans)Forming, Maintaining, Leveraging, and Disconnecting. The Connector's Journey provides designers and practitioners with a useful lens through which to consider the specific connectivity requirements of a person relative to the phase in the HC process they are in. This HC process framework helps frame more targeted HC research and can support designers in the scoping of HC challenges and in the generation of more specific HC solutions.

Five tactics for Finding

Finding – the first and arguably most important phase of the HC process is isolated and interrogated to derive the five unique tactics a person may adopt in achieving it. The five tactics are Stipulated, Sought, Suggested, Seduced, and Serendipitous. The acknowledgement and deeper understanding of this phase of the HC process – a phase which is often overlooked in existing frameworks – is a contribution in itself. The five Finding tactics present jumping-off points for discussion and research regarding the initiation of connections. The tactics, which highlight the different ways people find each other, can also aid designers in taking more targeted approach to the design of solutions that specifically support individual tactics or that cater to a wider range of tactics.

Behaviour Setting Canvas

The Behaviour Setting Canvas, co-developed in the course of this thesis, is a powerful tool that enables the detailed mapping of a behaviour setting in order to explain, predict, and/or manipulate behaviour. The behaviour setting canvas presents behaviour settings theory in a form more understandable and applicable to designers.

It is particularly powerful and effective for the likes of mapping the complexity of HC contexts, to support identification and understanding of all elements of a setting that can have a positive or negative influence on HC outcomes. The two levels of understanding afforded by behaviour settings (i.e., zoomed out and zoomed in) support designers and practitioners in being more comprehensive and more deliberate in addressing HC challenges, leveraging HC opportunities, and evaluating HC outcomes.

Human connectivity design support (19 HC design prompts)

A design support (19 HC design prompts) is developed, applied in the field, and evaluated. The 19 prompts can support the scoping and framing of HC challenges, the articulating of HC design briefs, and the evaluation of design outcomes. As such, the 19 prompts can support generative as well as evaluative design activities. Their neutral framing provokes discussion and guides the focus of designers seeking to improve HC outcomes. They add much needed structure to DfHC activities, providing designers and practitioners with a common language and acting as important boundary-type objects that facilitate communication and collaboration between researchers, designers, and practitioners (e.g., managers).

7.5. Limitations

This section addresses key limitations of this research, particularly as they relate to the contributions listed above and in general.

The adopted approach to structuring DfHC in this thesis built on the gap between the knowledge base and the HC environment, as manifested in the challenge areas. There are of course other ways such a formalisation might have been achieved, providing alternate lenses through which to view this vast and complex topic. Every approach has its inherent strengths and limitations, and we encourage future research and practice that explores DfHC through different lenses. Within the adopted structure, our focus was mostly on the relevance cycle and the rigour cycle – that is, supporting designers and practitioners in identifying, contextualising, and scoping HC challenges, and in grounding activities in the knowledge base respectively. The scope of this work did not afford an opportunity to fully develop the design cycle itself and that is an area that requires further attention.

The 2x2 "unfamiliarity matrix" facilitated the categorisation and articulation of extreme cases for study where HC challenges were likely to be more observable. Such cases are referred to in this thesis as *contemporary work situations*. Our decision to focus on a subset of such situations (i.e., experimental 'smart' workplaces, coworking spaces and multidisciplinary conferences) was necessary to contain the scope of the work. As expected, these situations were found to be rich sources of relevant data. Although the prompts were successfully applied in purposefully different situations, the limited number (and hence variety) of situations represented by these cases limits the potential generalisability of findings. There are many more types of contemporary work situations (e.g., hybrid work, gig work situations) where nuanced differences in HC challenges may exist. These situations and their respective HC challenges may therefore not be fully addressed by this research. That said, the strength of the links between our findings and the knowledge base that support them provides confidence regarding their applicability across other contexts.

Our deconstruction and interrogation of the HC process, which led to the Connector's Journey and the five Finding tactics, frames the process in terms more familiar and useful to design. Unlike existing HC process frameworks that tend to be tailored to a specific relationship type or HC context, this new framework prioritises understanding of the HC process (and its component parts) according to a person's phase-level objectives and activities, communicated in a way that is generalisable across contexts. While useful in guiding design activities aimed at supporting people at the phase level, this approach necessitated taking a broad view of the HC process and therefore limits the specificity of the support it offers. The specific requirements for the successful attainment of each phase's objective(s) and for successfully adopting a particular Finding tactic will likely differ between contexts and between people. For example, the requirements for supporting a person through the (trans)Forming phase in an onboarding context (e.g., a junior person joining an organisation) may be different from those required for supporting a senior business development executive (trans)Forming a connection with a new client. More work is required to understand the nuanced requirements of people across a range of contexts. In addition, this work was both inspired by and intended to support human centred design. Through our deconstruction of the HC process into its component

parts we sought to provide a frame from which common human centred design work (e.g., understanding the experience, feelings and desires of a person in a target context (Giacomin, 2014)) could be more effectively carried out. The use of the connector's journey to help frame human centred design processes has been explored though the extent of the usefulness requires further investigation.

The behaviour settings approach, combined with in-depth interviews to derive the barriers and enablers to HC in coworking spaces, provide a rich understanding of factors that can influence the HC process. The manifestation of these factors in the design prompts together with the successful application of prompts in different organisational contexts provides initial confidence as to their generalisability. However, to improve confidence in the generalisability of these outputs, more research is required in a broader range of contexts. Given the complexity and variety of HC (e.g., of contexts, needs, motives, and outcomes) it is likely that additional inhibiting or enhancing factors may be discovered, thus leading to the introduction of additional prompts. In addition, further testing will likely reveal some factors to be more or less relevant depending on the specific context. Variability in the prompts' applicability was not tested.

An important characteristic of contemporary work situations is the unfamiliarity of people, often due to the diversity of participants. In some situations (e.g., experimental workplaces and multidisciplinary conferences), participant diversity is intentional due to the acknowledged benefits of diversity for driving innovation and creativity (Pittaway et al., 2004). In other situations (e.g., some coworking spaces) participant diversity occurs naturally due to the nature of the service offered and the people such spaces attract. Although data were gathered across three continents and from a diverse mix of participants, thus adding depth to the insights derived, participants were all English-speaking (native or as a second language) and situated in developed, Western-style nations. This limits the generalisability of findings to such contexts. It should also be noted that much of the knowledge base that relates to HC, especially early research, is based on western (i.e., white American or British) participants although it is exciting to see this changing with a recent wave of research being conducted in the likes of China for example (e.g., Bloom et al., 2015; Du et al., 2022).

Consistent with the constructionist philosophical stance adopted for this research, qualitative methods were best suited for seeking explanations that increased general understanding of the situations studied (Easterby-Smith et al., 2012). The studies that comprised this research involved much observation and in-depth interviews. I also actively participated in some of the activities being studied, particular in the behaviour settings studies. With the exception of the surveys in the "Finding tactics" study (chapter 4), research methods employed (i.e., observation, immersion, discussion, interviews) were qualitative in nature. While these methods are appropriate for addressing the respective research questions and provide a deep understanding of various aspects of HC, such methods have their limitations. Data gathered can be subjective (e.g., experiences require accurate articulation by the participant and interpretation by the researcher) and time sensitive (e.g., are influenced by the emotional state of a person which can change from one moment to the next). In addition, the grounding of qualitative research in specific contexts can make it less generalisable to other contexts.

This work has generally framed HC in a positive light, as a strong motivator of behaviour due to the variety of functional, cognitive, and socio-emotional benefits a person derives from the connections to others. Although it was outside the scope of this research, it is important to also acknowledge and investigate the potential downsides of HC. While in chapter 2 we do mention the anxiety felt by many people when seeking to connect to others – mostly explained by a fear of rejection (Lavigne et al., 2011) and a sense of moral compromise (Casciaro et al., 2014) – a deeper understanding of other negative outcomes would help create a balanced picture of people's HC needs and experiences and how such negative outcomes might be addressed through design. For example, as digital platforms make it easier to accumulate contacts, a person's anxiety may increase when unable to effectively maintain all their connections. Therefore, what design solutions may support people in maintaining larger groups of contacts? Alternatively, how might people be supported in disconnecting from those contacts that offer fewer potential benefits? Also, in an "always on" digital age where people may experience connectivity overload, how might people be supported in "switching off" or in learning how to be more comfortable when in digital solitude? Ironically, despite people's improved

digital access to others through the internet and proximal access due to urbanisation, loneliness appears to be increasing rather than decreasing (Russo, 2018).

This work is foundational in its attempt to create an initial structure for the formalisation of DfHC and to provide the scaffolding for the continued development of this exciting field of design research and practice. Due to the limited scope afforded by a single PhD project, we had to make decisions to focus our efforts on what we saw as the fundamental building blocks of this effort. As well as decisions relating to which building blocks would be most useful in providing such a foundation, we also had to focus on a specific organisational context, to derive insights and to test our outputs. Focusing in such a way means that there will be areas that need further consolidation and support as well as gaps that need addressing through future research. Our intention was not, for example, to generate an exhaustive list of design prompts but rather, to develop a comprehensive set that would support creative and collaborative design activities, and that may stimulate future research to supplement our initial set. It is likely that further research (e.g., of other contexts and in other cultures) would identify additional factors that can contribute to a more complete set of prompts and support the generation of other equally useful HC design supports.

7.6. Future research

This thesis sought to provide a basis for DfHC and serve as a foundation for much research to come. Only a portion of the research questions presented in the initial research agenda (Table 6 of Chapter 2) were answered in this thesis. Our focus was on the formalisation of DfHC and on addressing several foundational questions explored through an examination of contemporary work situations. Answering these questions has led to numerous additional questions and opportunities for future research that could broaden and deepen DfHC as a distinct body of design research and practice.

From a scoping perspective, more research is needed to document, organise, and compare a broader range of HC challenges in professional as well as personal contexts. It is anticipated that many of the underlying mechanisms that explain HC challenges may be universal to professional as well as personal contexts, although

these may manifest in different ways. Research that considers a broader range of contexts may build on the current research and reveal a generalisable set of mechanisms that can support designers and practitioners in better understanding HC challenges and in delivering sought HC outcomes. As an example, many of the trends highlighted in chapter 2 (i.e., migration, digitisation, optimisation, and decentralisation) apply just as much to people in their personal lives as in their professional lives. This is exemplified by digitisation and the pursuit of optimisation in everyday settings such as the supermarket where manned checkouts are being replaced by self-checkout terminals. While certainly improving the efficiency of the shopping experience, such innovations deprive shoppers of seemingly inconsequential social interactions with checkout operators. These interactions do in fact represent important HC opportunities (Sandstrom & Dunn, 2013). Future work may seek to provide policy-level support for strategic decision making regarding desired HC outcomes and potential HC consequences in key social contexts (e.g., communities and organisations). This work may also be directed at developing design principles that guide the early stages of design processes in other fields, to support designers in understanding the potential HC consequences of the pursuit of other design objectives.

In line with the opportunity for research into scoping design challenges, more research is needed to document, organise, and compare the full range of outcomes (i.e., functional, cognitive, and socio-emotional) that people derive from their connections to others. While broad and deep, the current knowledge base is not usefully organised to support design. Much like the universality of HC challenges described above, it is fair to assume that the blurring of boundaries between professional and personal domains means that many HC outcomes may be represented across a range of contexts. For example, the cognitive outcome of broadening a person's perspective when connected to diverse others might manifest in professional contexts as improving a person's creativity or innovation potential, whereas in personal contexts it might manifest as increasing tolerance for dissimilar others. Better understanding how different types of HC outcomes manifest in different ways and in different contexts will support a broader general understanding

of the value of HC and how HC outcomes relate in other fields of design research such as positive design.

Future research may explore a broader range of motives that explain peoples' HC objectives. Currently, much is understood regarding the powerful influence that the need for belonging (commonly referred to in design research as "relatedness") has on people's motivation to connect to others and subsequent design outcomes. The influence of other motives on HC-related behaviour is less well explored. Further exploration of other relevant motives would aid designers in better understanding and predicting behaviour, and in designing to support improved HC outcomes. Obvious examples of this are the motives of "status" and "curiosity". Future research might consider how status and curiosity, as well as other motives, manifest as HC outcomes and thus influence connectivity behaviour in different contexts.

Our deconstruction of the HC process into the 5-phase Connector's Journey provides a strong foundation on which to ground future research. Such research may interrogate the Connector's Journey in more detail, considering, for example, how effectively the requirements of each phase are currently met in different contexts and how these may be better supported through design. Future work may seek to understand the relationship between the HC process and outcomes. For example, how, if at all, does the HC process change when the HC outcomes someone seeks are functional or cognitive rather than socio-emotional? Another important question relates to the possible relationship between phases and prompts. That is, are certain prompts more relevant in some phases than in others?

Building on our detailed analysis of the Finding phase, more work is needed to identify and explain possible relationships between Finding tactics and individual or contextual factors. Our work considered the prevalence of Finding tactics in one context, namely professional business conferences. Replicating this work across a range of other contexts will help to reveal if and how different tactics are better suited to different contexts and for different types of connections. Additional research may also explore if and how some tactics are (or might be) better supported through design. For example, what guidelines can support the design of interventions or spaces that encourage and foster serendipitous versus suggested connections? Furthermore, future research may explore the potential application of the Finding

tactics in completely different contexts. For example, to what extent do the five Finding tactics apply to the available tactics a person may adopt when finding a job or a new home?

The other phases of the Connector's Journey (i.e., (trans)Forming, Maintaining, Leveraging, Disconnecting) also warrant deeper investigation. Because substantial time, energy, and other resources can be required to sufficiently (trans)form a connection, supporting people in the (trans)Forming phase, or in determining when a person should instead consider disconnecting, will be a valuable contribution. Other work may look at the role design research and practice can play in supporting the maintenance of different types of connections. As more organisations are experimenting with distributed and hybrid work models, the necessity to keep connections intact through maintenance is likely to grow. Leveraging and Disconnecting are also phases that warrant more attention in design research. Research that provides a better understanding of why some people fail to leverage key connections (i.e., don't gain desired value from a connection) and how to support people in the Leveraging phase will be valuable for individuals and organisation alike. Similarly, as digital technologies make it easier to connect to and engage with more people, for genuine or malicious reasons, design solutions that support fully Disconnecting from unfavourable contacts will likely become more critical in the coming decades.

As mentioned already in this chapter, our intention was not to create an exhaustive list of design prompts. Further research is required to uncover additional factors, elements, or other insights which may inform the development of additional design prompts and other supports. The derivation of additional prompts is likely to come from research that explores HC challenges in a broader range of professional and person contexts, and across different cultures. In addition to the continued evolution of the design prompts as a tool to support DfHC in addressing an ever-broader range of HC challenges, future work should seek to understand the relative importance or relevance of individual prompts across different contexts. As well as establishing the generalisability of the prompts, such work will support the categorisation and prioritisation of prompts according to context or setting type as well as HC challenge type, thus facilitating the design process.

In the current research, the design prompts were applied to three unique cases yet the method of application (i.e., facilitated workshop) was similar across all. In addition, the design activities that the prompts supported were predominantly evaluative in that they mostly helped identify and explain deficiencies in existing designs. Scaling of the design prompts as a tool to support the continued growth of DfHC will require the development of documentation that supports their unfacilitated application. The development of such documentation will make a valuable future contribution to this research. Further establishing the value of the design prompts in supporting generative design activities will require their application in such contexts.

One of the current deficiencies in DfHC as highlighted in this work is the lack of useful measurement instruments that take a holistic view of HC outcomes and enable the accurate evaluation of DfHC activities within the design cycle and the relevance cycle. The structure provided by this work (e.g., the phases of the HC process and the 19 design prompts) can aid the future development of new instruments and methods that address these deficiencies and support designers and practitioners in measuring the outcomes of HC design activities. Departing from existing instruments that seek to measure a person's overall sense of connectedness (or loneliness), new measures may instead focus on a specific phase of the HC process. New instruments may seek to measure, for example, the findability of people in a certain context, or the degree to which a connection has (trans)formed.

And finally, existing design methods and research can likely provide further support to the formalisation of DfHC. For example, where this work spent considerable time seeking to understand and prescribe how HC challenges could better be scoped, future work might build on this to define the key requirements of a DfHC design brief or how existing design methods and tools could support the DfHC design cycle. Building on the foundation provided by the design prompts, future work might look to better support design processes for key intervention types. For example, in organisational contexts this could include specific HC-related events (e.g., networking events, workshops, and away-days) but could equally include critical moments (e.g., onboarding) or even entire systems (e.g., organisational design) where HC plays a critical role.

7.7. Conclusions

The need to feel and be connected to others is fundamental and universal to most people, both personally and professionally. It is through a person's connections to others that numerous benefits are derived, from a socio-emotional sense of belonging to the functional access to resources and opportunities. Yet despite what is at stake, and while the need for connection remains ever-strong, numerous geographical, political, technological, social, and economic trends trends mean that many people struggle to successfully negotiate the HC process and thus fail to satisfy their HC needs. Not only do individuals themselves suffer but the cost to organisations and society at large can be substantial. Addressing this global challenge requires a fundamental shift in the focus of HC research, away from continuing to explain the importance of HC outcomes and the impact of HC on other outcomes (e.g., organisational performance) and toward better understanding the HC process and supporting people through that process. Design research and practice has a critical role to play in this shift.

Our exploration of HC-related research and practice revealed a vast landscape of knowledge and activities that touch upon or that are embedded in a broad range of subject areas from anthropology and sociology to architecture and organisational design. While this can readily lead to overwhelm, and certainly highlights the sheer breadth in the types of outcomes people derive through their connections to others, the universal nature of HC also alludes to a fundamental set of mechanisms or principles that support understanding of the HC process. The current work makes important steps in the derivation and articulation of these mechanisms and principles. We found that framing the HC process from the perspective of the protagonist (i.e., the Connector) reveals a generalisable journey that enables a more nuanced understanding of HC objectives that change throughout the process.

To be able to apply design methods in effectively addressing HC challenges requires that such challenges are accurately understood and scoped. Various aspects of the current work support this requirement. Our deconstruction of the HC process showed how HC challenges can be scoped at the phase-level as well as at an overall level. Interrogation of the Finding phase showed that within a single phase, a more

nuanced understanding of HC challenges may be gained through specifying the distinct tactics a person may adopt in achieving that phase. And finally, our work identifying specific elements in a setting that can help or hinder the HC process highlighted numerous factors that aid the scoping of HC challenges as well as informing and inspiring of generative and evaluative design activities.

Despite our focus on a limited range of purposefully selected contexts and the natural limitations of the qualitative research methods employed, we were satisfied with the depth of insights derived through this research. Perhaps the most reliable indicator of the value of this work was the positive results derived through the application of our key design output (i.e., the 19 design prompts) in a variety of real-world settings. Participants confirmed both the usefulness and the usability of the prompts in supporting evaluative as well as generative design activities.

This work shows that HC need not and should not be left to chance. Nor should the onus rest solely with individuals to improve their HC outcomes. Despite, or perhaps because of, the fundamental importance of HC in people's lives and the seemingly innate social ability of humans as a species, it seems that HC as a process has largely been taken for granted. This work has shown that by better understanding the HC process and a person's objectives and requirements throughout that process, HC challenges can be scoped in a way that makes them addressable through design. Although many HC challenges are grounded in human factors, this work highlights the importance of contextualising HC challenges and considering all aspects of a context that can contribute to HC outcomes.

We perceive substantial opportunities for positive impact through the ongoing structured and systematic development of DfHC as a distinct field of design research and practice. Anticipating the continued growth of trends that sustain the strain on people's abilities to meet their HC needs, the demand for solutions to address ever-complex HC challenges will only grow in the coming decades. We believe that design research and practice have a critical role to play in addressing these growing HC challenges, and this work lays the foundation for such a development.

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Appendix 1: Finding tactics survey – Study 1a (paper version)

How we connect – survey

Introduction and data policy

This study – sponsored by Imperial College London – forms part of a PhD research project that seeks to improve our understanding of human connectivity by identifying and categorising the various approaches people take to finding and forming relevant and meaningful connections.

Participation is voluntary and completely anonymous. You can withdraw at any time. No personal information will be collected that could be used to identify you. You can find out more about this study here: https://bit.ly/2DXsWWy. The data we do collect will be handled according to the official data and GDPR policies of Imperial College London, details of which can be found here: https://www.imperial.ac.uk/admin-services/legal-services-office/data-protection.

I have read and understood the above text. I give consent for the information I provide to be used in this study. ☐ Please tick

About you:

Your age _____

Your gender (circle one): Male / Female / Other

The country you grew up in (if more than one, which do you identify most with): _____

Where do you spend most of your time? (circle one):

　　　City / Town / Village / Farm / Completely Remote / Other: _____

Connecting and connections:

Note: By 'relevant and meaningful connections', we are referring to your connections to other people that provide value to you in some way from social value (e.g. sense of belonging and support) to practical value (e.g. help you to achieve your personal and professional goals).

For the questions below, **please circle one option**.

On average, how many people do you interact with in a meaningful way on a regular work day?

　　　0　　　1-2　　　3-5　　　6-10　　　More than 10

On average, how many people do you interact with in a meaningful way on a regular weekend day?

　　　0　　　1-2　　　3-5　　　6-10　　　More than 10

How easy do you think it is to find new people to connect with?

　　　Very easy　　　1　　　2　　　3　　　4　　　5　　　Very difficult

How comfortable are you when connecting to new people?

　　　Very comfortable　　1　　　2　　　3　　　4　　　5　　　Very uncomfortable

How well connected do you feel to other people in general (that you have ready access to the people you need to feel socially fulfilled and achieve your personal and professional objectives)?

　　　Very poorly connected　　1　　　2　　　3　　　4　　　5　　　Very well connected

Please turn the page >>

If you, or someone you know, is experiencing loneliness or isolation, there are people and organisations who can help. One such organisation is the Samaritans: https://www.samaritans.org/news/isolation-loneliness

'How we connect' PhD Study　　　　　　v.02 09/10/2018　　　　　　Contact: Peter Mandeno (PJM1217@ic.ac.uk)

Your most valuable personal connection:

Think about your most valuable **personal** connection not including extended family (e.g. best friend, life partner, mentor).

It is important that you clearly have one person in mind before you proceed. If you have many, just choose one.

In which year did you first connect with this person? _____

Please describe how you came to be connected (the setting, the circumstances and what happened):

Provide as much detail as possible. It can help to think of where you were and the chronological chain of events.

How would you describe the value you receive from this connection?

This could be social or practical value or a combination. What is it that you get from being connected to them?

_____   _____
_____   _____
_____   _____
_____   _____
_____   _____
_____   _____
_____   _____
_____   _____
_____   _____

Your most valuable professional (work) connection:

Think about your most valuable **professional** connection not including extended family (e.g. best friend, life partner, mentor).

It is important that you clearly have one person in mind before you proceed. If you have many, just choose one.

In which year did you first connect with this person? _____

Please describe how you came to be connected (the setting, the circumstances and what happened:

Provide as much detail as possible. It can help to think of where you were and the chronological chain of events.

How would you describe the value you receive from this connection?

This could be social or practical value or a combination. What is it that you get from being connected to them?

_____   _____
_____   _____
_____   _____
_____   _____
_____   _____
_____   _____
_____   _____
_____   _____
_____   _____

Appendix 2: Finding tactics survey – Study 1b

1) Please think of the one person who you would describe as the most valuable connection you made at the conference (the first person you think of). How was your connection to them initiated?

- Stipulated - e.g. A workshop facilitator paired us together or told us to work in the same group.

- Sought - e.g. I was looking for someone to answer a specific question. I sought them out and connected with them.

- Suggested - e.g. Someone introduced us or otherwise suggested that I should connect with them.

- Seduced - e.g. They approached me because of something I had done/shared (e.g. a talk I gave or workshop I ran).

- Serendipitous - e.g. We bumped into each other completely by chance. Right time, right place.

- Other

2) Still thinking about that same person, please describe (in as much detail as possible) how the connection came about, using the questions below as inspiration: What led up to the connection? Who did and said what to whom? What happened next? What were you thinking and feeling at that moment? What was the outcome?

3) How would you describe the value that this connection brought, or you expect will bring you?

4) Now, thinking about all of the connections you made at the conference, what percentage of them were initiated by each of the five methods introduced above. Total (calculates automatically) must equal 100%.

- Stipulated (Someone/something put us together) : _____

- Sought (I looked them up) : _____

- Suggested (Someone told me about them) : _____

- Seduced (They were attracted to me because of something I did) : _____

- Serendipitous (By coincidence or chance) : _____

- Total : _____

5) To what extent do you agree that following factors motivated you to attend the conference?

	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree
To learn new things					
To make new connections					
To reconnect to people I already know					
To be entertained					
To work with others to solve problems					
To discuss or promote my company or work					
To be an influencer in my professional circles					

Appendix 3: Discussion Guide: Behaviour settings – semi-structured interviews

S1 - Braindate (BD) - Discussion guide

1) Introductory questions about you
   a) In which country are you based?
   b) In which industry do you work and what type of work do you do?
   c) What was/were your primary reason(s) for attending this conference?

2) The Braindate experience overall
   a) Overall, how did your braindate experience match your expectations?
   b) What did you like the most?
   c) What did you like the least?
   d) If you could change anything, what would it be?

3) What motivated you to take part in the braindate experience?
   i) Were you the 'host' (suggesting a topic) or a 'guest' (responding to someone else's topic)?
   ii) What did you hope to achieve, and what would that mean for you?
   iii) How would you define success?
   iv) Please explain…

4) Routine: Please talk me through your braindate experience from beginning to end – from before you arrived at the braindate lounge until after you had departed. Include all steps and try to be as detailed as possible, without sharing personal information about your braindate partner and your conversation of course.

5) What aspects of the general setting or environment supported or inhibited the experience?
   a) In what way(s)? In which parts of the experience?

6) What items or objects within the setting (either provided by the experience or belonging to you) supported or inhibited the experience?
   a) In what way(s)? In which parts of the experience?

7) Which other people played a role in your braindate experience, and what role(s) did they play? (How about your braindate partner? How about braindate staff?)
   a) How did they help or hinder the experience? In which parts of the experience?

8) How did your behaviour reflect what you think was expected or appropriate? And what about the behaviour of others?

9) Is there anything we haven't spoken about that you think we should?

S2 - Outdoor Networking (ON) - Discussion guide

1) Introductory questions about you

   a) In which country are you based?

   b) In which industry do you work and what type of work do you do?

   c) What was/were your primary reason(s) for attending this conference?

2) What motivated you to enter the outdoor networking space?

What did you hope to achieve, and what would that mean for you?

[If participant does not mention human connectivity in any form, prompt them to determine if this was a conscious or subconscious intention – e.g., did you make any new connections, intentionally or unintentionally?

If none whatsoever, thank them and move on]

   a) Thinking about your networking experience (intentional or unintentional), how did your experience match your expectations?

   b) What did you like the most?

   c) What did you like the least?

   d) If you could change anything, what would it be?

3) Routine: Please think about a particularly memorable connection. Now please talk me through that one networking experience from beginning to end. Include all steps and try to be as detailed as possible, without sharing personal information about your new contact and your conversation of course.

4) What aspects of the general setting or environment supported or inhibited your networking experience? (prompt if they are stuck: the general setting, the buildings, the signage, the food outlets, the sound or light systems)

   a) In what way(s)?

5) What items or objects within the setting (either provided by the conference or belonging to you) supported or inhibited the networking experience? (prompt if they are stuck: tables, chairs, bins, food items, clothes, electronics)

   a) In what way(s)?

6) Which other people played a role in your networking experience, and what role(s) did they play? (How about the person you connected to? Other conference delegates? Conference staff? Food vendors?)

   a) How did they help or hinder the experience? In which parts of the experience?

7) Is there anything we haven't spoken about that you think we should?

S3 - Ball pit Networking (BN) - Discussion guide

1) Introductory questions about you

    a) In which country are you based?

    b) In which industry do you work and what type of work do you do?

    c) What was/were your primary reason(s) for attending this conference?

2) What motivated you to enter the "Connect Sessions" space?

    What did you hope to achieve, and what would that mean for you?

    [If participant does not mention human connectivity in any form, prompt them to determine if this was a conscious or subconscious intention – e.g., did you make any new connections, intentionally or unintentionally?

    If none whatsoever, thank them and move on]

    a) Thinking about your ball pit networking experience (intentional or unintentional), how did your experience match your expectations?

    b) What did you like the most?

    c) What did you like the least?

    d) If you could change anything, what would it be?

3) Routine: Please think about a particularly memorable connection. Now please talk me through that one networking experience from beginning to end. Include all steps and try to be as detailed as possible, without sharing personal information about your new contact and your conversation of course.

4) What aspects of the general setting or environment supported or inhibited your networking experience? (prompt if they are stuck: the general setting, the ball pit, the signage, the market stalls, the sound or light systems)

    a) In what way(s)?

5) What items or objects within the setting (either provided by the conference or belonging to you) supported or inhibited the networking experience? (prompt if they are stuck: cushions, conversation starter cards, food/drink items, clothes)

    a) In what way(s)?

6) Which other people played a role in your networking experience, and what role(s) did they play? (How about the person you connected to? Other conference delegates? Conference staff?)

    a) How did they help or hinder the experience? In which parts of the experience?

7) Is there anything we haven't spoken about that you think we should?

S3 – Workplace Connecting (WC) – Discussion guide

1) Open question: What has been your experience of connecting to others in your time at "The HUB"?
   a) How is it different from what you expected or hoped?
   b) If different, why do you think that is?
   c) What about The HUB is different (better or worse) for supporting human connectivity when you compare it to workplaces you've worked at in the past?

2) What would you say motivates you to connect to others in The HUB?

3) [SHOW MAP] Thinking about connecting with others, both socially and to get work done, which spaces would you say you use the most?

4) Do you use different parts of the space for different types of connections or outcomes? In what way(s)?

5) Do you feel or behave/connect differently in different parts of the HUB? In what way(s)? Why do you think this is? What is it about these spaces that explains the differences in how you behave differently?

6) What is it about those spaces that makes them more suitable/effective for different types of connecting?
   a) Do you think they're designed well? Do they include the right things?
   b) What is lacking?
   c) Do you think these spaces are used as they were intended?
   d) Do you believe others think/behave the same as you?

7) Aside from the physical infrastructure and layout, what other tools or things (your own or belonging to the organisation) do you use to connect or stay connected with others (e.g. digital tools, noticeboards)? What role do those things play?

8) How do other people play a role in supporting (or hindering) connectivity? What role(s) do they play?

9) What is your usual process for connecting with others? Can you think of a memorable example and talk me through what happened?

10) Do you think you have the skills required to connect to the right people?
   a) And how about other people – how does their skill level compare to yours?

11) What does the organisation do to help you to connect to or make the most of your connections to others?
   a) What works / doesn't work and why do you think that is?

Appendix 4: Discussion Guide: HC experience in the context of co-working (semi-structured interviews)

1) Introductory questions about you and your business
   a) What is your age?
   b) In which country did you grow up?
   c) How many people work in your company?
   d) What type of work do you do?
   e) What would you say is the industry in which you work?
   f) How long have you been coworking (including your current space and any previous ones?
      i) What type of coworking membership do you currently have (e.g. hot-desk, permanent desk, part-time)?
      ii) Name of our coworking space?
      iii) City of your coworking space?
      iv) Size of your coworking space?

2) General questions – your thoughts on coworking and coworking spaces.
   a) What would you say was your main motivation to join a coworking space?
   b) What was your situation at the time and what were you looking for?
   c) Was your decision in response to a particular challenge you needed to solve or perhaps an opportunity?
   d) What was it about your current coworking space that made you decide to become a member there?
   e) How would you say your experience so far has matched the expectations you had when you joined?
   f) The word 'Coworking' is a combination of 'co' and 'working'. What is the 'co' short for as it relates to you?

3) Questions specific to connecting in the context of coworking
   a) What has your general experience been of connecting to other people since you've been coworking?
   b) Have you found it easy/difficult to establish the connections you expected or needed to make?
   c) How has your experience measured up to the expectations you had when joining the space?

       i)   What has been the best part of your connectivity experience?

      ii) What has been the worst part?

  d) Does connecting happen automatically (seemingly by itself) or are you purposeful about it?

       i)   What is your preferred approach to making the connections you seek / need?

      ii) What supports this happening?

     iii) What do you do personally to support this happening?

  e) What gets in the way of you making the connections you expect / need / want to make?

       i)   Anything else?

      ii) In what way does this thing (these things) affect your ability to connect or connectivity outcomes?

     iii) What, if anything, do you do to overcome these factors?

  f) How does technology play a role in the way you connect?

       i)   Is this useful or not? In what ways?

  g) How (if at all) does the coworking space, including facilities and staff, play a role?

       i)   Is this useful or not? In what ways?

  h) Do you think the experience of others is the same or different?

       i)   In what way(s)?

  i) When you think about the most valuable connection(s) you have made since joining your current coworking space. [pause to give time to think].

       i)   How did they come about?

      ii) Why do they stand out as being valuable to you?

     iii) How would you describe the value you get from the connection?

     iv) What makes this connection different to the others that you've made?

4) Is there anything we haven't spoken about that you think we should?

Publications

Mandeno, P., & Baxter, W. L. (2021). Six principles for the design of better networking events. *Business Horizons*. https://doi.org/10.1016/j.bushor.2021.06.006

Mandeno, P., & Baxter, W. (2020). Barriers to Human Connectivity and the Design of More Collaborative Coworking Spaces. Proceedings of the Design Society: DESIGN Conference, 1, 1475-1484. https://doi.org/10.1017/dsd.2020.142

Mandeno, P., & Baxter, W. L. (2019, September). Design for human connectivity: A framework and research agenda. In International Association of Societies of Design Research Conference 2019 Design Revolutions.