

Design for human connectivity: A framework and research agenda

Mandeno, Peter^{*a}; Baxter, Weston^a

^a Dyson School of Design Engineering, London, United Kingdom

* p.mandeno17@imperial.ac.uk

Human Connectivity is one of the most important social challenges affecting individuals, communities, institutions and organisations worldwide. Despite volumes of literature making a compelling case for the benefits of being better connected and the detrimental effects of being poorly connected, comparably little work explains how successful human connectivity outcomes might consistently be achieved. This paper addresses this gap by introducing designing for human connectivity as an important design research challenge, presenting a model for analysing connectivity interventions and suggesting an agenda for future research. Human connectivity outcomes may be categorised as emotional, cognitive or functional and we propose that their successful attainment across the four distinct phases of the connectivity process is a function of the interplay between motives, enablers and barriers. A review of extant literature and the analysis of existing connectivity interventions results in a list of critical factors that may inform the design of more effective interventions, to consistently deliver improved human connectivity outcomes.

Keywords: *human connectivity; societal challenges; design principles; motives*

1 Introduction

Human connectivity is one of the most important social challenges affecting individuals, communities, institutions and organisations worldwide. Seismic shifts in the way we live, work and play are straining the very fabric of the networks that have sustained us in the past, suggesting a need to rethink the types of connections we require and the ways in which they can best be established. With an ever-growing body of evidence making the case for *why* people require relevant and meaningful connections to thrive, this paper presents both a challenge and initial guidance for designers to instead consider *how* this might be achieved.

According to Dan Schawbel at Forbes magazine, society is experiencing a "crisis of connection" (Schawbel, 2017). Taking an organisational perspective, the former Surgeon General of the United States, describes what he calls a "loneliness epidemic" in the workplace (Murthy, 2017). Whether we describe it as a crisis, an epidemic or simply an important societal and organisational challenge, the effects of people being poorly connected can be devastating for individuals and organisations alike. There are millions of people across the globe who suffer from feeling isolated, as well as countless organisations performing sub-optimally where innovations are stifled by silos and key stakeholders are unwilling to collaborate. Feeling poorly connected can detrimentally affect a person's health,

happiness and prosperity as well as an organisation's performance. Interest in the negative consequences of being poorly connected seems to have intensified in the past few decades, with books like *Bowling Alone: Americas Declining Social Capital* (Putnam, 1995) and *Loneliness: human nature and the need for social connection* (Cacioppo, 2009) attracting widespread public and academic attention.

Humans are strongly motivated to connect with others. This stems from a fundamental need to belong (Baumeister & Leary, 1995). People expend a large amount of energy satisfying the need for strong relationships (Wesselmann et al., 2016), in order to derive a range of benefits which may be categorised as either emotional, cognitive or functional. While the need to connect to others appears to be universal, deeply rooted in the evolution of humans as social creatures (Dunbar, 1998), approaches to connecting to others varies across cultures, situations and settings (Meyer, 2014).

The aims of many design initiatives are to encourage, enable, facilitate or manage connectivity between people – sometimes intentionally but often by accident, as a by-product of meeting some other primary objective. However, there is little, if any, extant literature showing why and how some design interventions seem to work well and others do not. As such, there is a gap in the literature prescribing how to design for improved and consistent human connectivity outcomes.

The contribution of this paper is threefold. Firstly, we begin to shift the conversation from one that has been primarily descriptive – explaining and making the case for the need to connect and be connected – to a prescriptive one in which we focus on how improved human connectivity outcomes may more consistently and predictably be achieved. Secondly, we present a model for considering connectivity interventions in order to understand and predict human connectivity outcomes. Finally, we suggest a research agenda to inspire and advance future research in this field.

We begin by defining connectivity and describing the process and its outcomes, both positive and negative. Next, we present a model for analysing and understanding the effectiveness of human connectivity interventions. 'Design for connectivity' as a domain is introduced and an agenda for future research is suggested.

2 Human Connectivity: Definition, process and outcome

Human connectivity is both a process (the act of connecting) and an outcome (being connected). The extant literature contains many connectivity-related terms often used interchangeably including *network*, *relationships*, *relations*, *contacts*, *connections*, *community*, *links* and *ties* (e.g. Baker, 2000), *bonds* (Adler & Kwon, 2002; Healey, Hodgkinson, Whittington, & Johnson, 2015) and *pipes* (Baker, 2014). *Bonds*, *ties*, *pipes* and *links* are synonymous with *connections* which we refer to as a direct or indirect social contract or other agreement, exchange or structure that connects two individuals. It does not refer to the individuals themselves, who may be considered *contacts* (e.g. Susan is a *contact* of Pedro. Susan and Pedro have a strong *connection*).

2.1 The process of connecting

Understanding the distinct phases of the human connectivity process should enable us to prescribe interventions that address the specific needs of individuals in each phase. A review of the literature reveals a variety of frameworks that divide the human connectivity

process into distinct phases. There exists a general distinction between organisational contexts – where the focus is on key stakeholder connections such as buyer-seller relationships (e.g. Dwyer, Schurr, & Oh, 1987; Morgan, 2015), and personal contexts – where the focus is on romantic relationships (e.g. Gillath, Karantzas, & Fraley, 2016; Knapp, 1978). Although the labels and number of phases vary widely across the various frameworks, they all tend to include the full life cycle of the connection, beginning only once a potentially relevant other has been identified and ending with the termination of the connection.

Building on the literature, we propose a four-phase framework of connectivity (Figure 1), namely finding, forming, maintaining and leveraging. Finding refers to the discovery or identification of another person with whom one connects. Forming refers to the actions taken and investment made in establishing the connection to a point that it may ultimately deliver value of some kind to one or both of the connected individuals. Maintaining is required when the value inherent in a connection is ongoing or otherwise not immediately recognised or realisable, and the connection must be kept intact until such time that it is. Leveraging refers to the realisation of the value gained from the connection. This list differs from existing frameworks in the inclusion of finding (where others assume individuals know of each other) and that it ends with the broad term leveraging rather than context specific outcomes. Although ‘termination’ is acknowledged to be a distinct phase, it is omitted as the intention here is not to design for termination. Both unintentional termination such as failures in other phases and intentional termination may be subject for separate analysis.

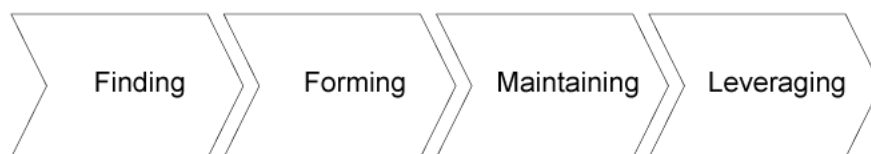


Figure 1: The Four Phases Comprising the Process of Human Connectivity

The ultimate objective of human connectivity is deriving value from those with whom one is connected. It is in the leveraging phase of the process that the value inherent in the connection is realised. This value may be emotional (e.g. feeling a sense of belonging to a person or group), cognitive (e.g. learning something new), or practical (e.g. receiving assistance with a problem). These categories of value are not mutually exclusive.

The process of connecting generally follows these phases in sequential chronological order but not always. For example, in the case of purely transactional encounters, a person may identify a relevant target (finding) and establish contact with them (forming) in order to request something from them (leveraging). Minimal time is spent forming the connection and no maintenance is required. Such connections are generally short-lived. In the case of particularly valuable connections (e.g. strategic business relationships or best friends) the connection may be maintained and leveraged repeatedly over a long period of time. When people fail to connect to others, it may be the result of failing to find people to connect with in the first place, or a failure to form a connection once a relevant other is found. Interestingly, once connections are formed, they will rarely be broken intentionally. People seem to go out of their way to keep connections intact (Baumeister & Leary, 1995).

2.2 Connectivity outcomes

Being connected to others is a fundamental human need, suggesting that people derive value from being connected to others and/or experience loss or pain from being

disconnected. This section discusses the benefits and detrimental effects of being well and poorly connected, respectively.

As introduced above, the benefits of being well connected can generally be categorised as emotional, cognitive and functional. That is, being better connected makes us feel better and/or delivers some kind of useful information or practical benefit. Generally, people who are socially well connected are happier and tend to live longer (Holt-Lunstad, Smith, Baker, Harris, & Stephenson, 2015; Miller, 2011). Examples of the cognitive and functional benefits of better connectivity include: more successful career (e.g. Useem & Karabel, 1986) – for example the publishing success of academics (e.g. Newman, 2004; Servia-Rodríguez, Noulas, Mascolo, Fernández-Vilas, & Díaz-Redondo, 2015); more effective task completion (e.g. Kadushin, 2004); access to valuable information (e.g. Inkpen & Tsang, 2005); being included in new opportunities (e.g. Burt, 2000); and ability to exert influence over others (e.g. Burt, 2000).

Whippman (2017) suggests that the strength of one's relationships is the best way to predict how happy they are in life. However, It is worth noting that connections between individuals need not be strong to have a positive effect. In a study that explored the effect of brief social interactions with strangers – in this case, baristas at a coffee shop – Sandstrom and Dunn (2013) found that people who simply engaged in a quick interaction with the barista were happier than those who did not.

Conversely, the psychological and physiological effects of being poorly connected or socially isolated (often referred to as 'loneliness') can be devastating. In an extensive meta-analysis of studies of social isolation and loneliness spanning a 34 year period to 2014, Holt-Lunstad et al. (2015) found that loneliness increased a person's likelihood of mortality by 26%. This is comparable to the detrimental effects of smoking and worse than other known causes of mortality such as obesity and sedentary behaviour (Holt-Lunstad, Smith, & Layton, 2010). Crumpacker (2008) makes a direct link between social connectedness and the likelihood of elderly people in the United States to commit suicide. Similarly, there appear to be cognitive disadvantages to being poorly connected. In a study designed to explore how a person's sense of belonging may affect their intelligence, researchers found that even when people simply believed they would end up alone later in life, their performance in cognitive tasks suffered (Baumeister, 2002). It is important to note that feeling lonely (generally referring to a psychological state) is not the same as being alone (a physical state of solitude) (Epley & Schroeder, 2014). It is possible to be alone yet still feel very connected to others. Likewise, it is possible to be surrounded by others and yet still feel very lonely.

While the extant literature, including mainstream media and organisational press, makes a compelling case for the fundamental need of people to be connected in order thrive in all aspects of their lives, our review of the literature emphasises that work to date is primarily descriptive in nature. The few examples that do exist provide semi-prescriptive advice regarding subjects such as 'how to network' (e.g. Casciaro, Gino, & Kouchaki, 2016) and how to improve social matching on online platforms (e.g. Terveen & McDonald, 2005). In her experiments with performative objects, Niedderer (2007) suggests that we might create "mindful interaction through the use of objects in social contexts" (p.3). Although the extant literature may inspire designers to recognise a lack of human connectivity as a problem worth solving and provide confidence that positive outcomes may be achieved through design (Desmet & Pohlmeier, 2013), it does not go far enough to prescribe how this might

be achieved in this specific context. Lacking such guidance, our observations and conversations with a range of practitioners suggest that designers rely on intuition, their own experience and anecdotal evidence. We therefore propose that a better understanding of what drives people to connect with each other as well as the factors that help and hinder them in this process is needed. Armed with this knowledge, designers might then be in a position to take a more human-centred approach to “gain and apply knowledge about human beings and their interaction with the environment, to design [experiences, systems,] products or services that meet their needs and aspirations” (van der Bijl-Brouwer & Dorst, 2017, p. 2).

3 A model for predicting human connectivity outcomes and designing to improve them

Designing for human connectivity centres upon guiding people through the connectivity steps found in Figure 1. This may be achieved through the creation of interventions to fulfil each connectivity phase as well as means to make such interventions more efficient. Human connectivity (C) successfully occurs when a motive (m) is coupled with a net positive opportunity (Figure 2). If a person is not motivated to connect, efforts to help them to connect will be futile. Similarly, if barriers (b) outweigh enablers (e), even motivated attempts to connect will fall short. Finally, the degree of motivation and net opportunity moderates the success or efficiency of connecting.

$$C = m (e - b)$$

Figure 2: A model for predicting the likelihood of successful human connectivity

Behaviour settings offer a theoretical framework to understand contextual factors leading to behavioural occurrence and success. Using behaviour settings as a guide to analyse human connectivity, we can begin to identify key components of the environment influencing the success of the target connectivity. Adjusting these behaviour setting components such as motives, infrastructure, props, scripts, norms and roles can lead to reasonable design interventions and generalisable intervention principles (Aunger & Curtis, 2016). In this section, we simplify such an analysis into the three components of motives, enablers and barriers to connectivity, drawing insights from extant literature and observations from a sample of connectivity-related design intervention examples. The sampled example interventions are provided in Table 1 including a summarised exploration of the behaviour setting dimensions, connectivity enablers and (overcome) connectivity barriers. Motives, enablers and barriers are explored in more depth in the sections that follow.

Table 1. Behaviour setting theory as framework to analyse human connectivity interventions (experiences, services and products)

| Connectivity Intervention | Behaviour setting dimension and example features of intervention design | Connectivity enablers | (Overcome) connectivity barriers |
|---|---|--|---|
| Wok+Wine is a social experience designed to 'connect participants to people they didn't know they were looking for'. | Stage: Unique and unexpected venues serve to disarm participants and provide conversation starters. Unfamiliarity of venue means the setting is neutral to most people. Nobody has a 'home-turf advantage'. | Unique environmental cues Neutral territory | Fear of rejection Negative ingroup/outgroup biases Mistrust |

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| <p>McCracken (2013) describes Wok+Wine as “an experiment in social chemistry”. 40-50 participants (mostly strangers to each other) stand around a long communal table covered in newspaper and banana leaves peeling and eating jumbo prawns with their hands. The prawns are paired with one type of wine.</p> | <p>Props: Central communal table brings participants together. Labels around necks of wine bottles state “Serve yourself... and someone else”, encouraging participation.</p> | <p>Shared experience</p> <p>Behavioural prompts</p> | <p>Lack of perceived relevance</p> <p>Limitations of emotional information processing ability</p> |
| | <p>Roles: Absence of waiting staff means participants are required to assume that role. Serving others equates to small acts of kindness that help to establish trust.</p> | <p>Role disruption</p> | <p>Low self-efficacy</p> <p>Poor proximity / propinquity</p> |
| | <p>Norms: Participants stand very close to each other (literally touching shoulders) and eat with their hands thereby breaking two conventional social norms. Stepping outside their comfort zones is made comfortable by being part of the group. Food is cooked in full view of participants, in a huge (60cm) wok over a custom-built gas burner, adding theatre.</p> | <p>Intimacy</p> <p>Collective discomfort</p> <p>Transparency</p> | <p>Lack of legitimacy</p> <p>Inappropriate form</p> |
| | <p>Objective: Events typically have no set objective or agenda. This removes pressure on participants to perform according to metrics set by the organisation. Participants encouraged to find value in their own way.</p> | <p>Authenticity</p> <p>Individual’s purpose (not that of the organiser)</p> | |
| <p>Brain Dates is a service, typically offered at conferences, that matches participants for interesting conversations. Conference goers sign up in advance, indicating the types of people they wish to meet. On arrival, a matchmaker introduces the two attendees and they are offered a range of both usual and unusual settings for their conversation.</p> | <p>Stage: Participants given options regarding the setting in which they would like to meet, from typical (e.g. café) to unusual (e.g. on a lake).</p> | <p>Unique environmental cues</p> | <p>Fear of rejection</p> <p>Negative ingroup/outgroup biases</p> |
| | <p>Props: Settings enhanced by unique props that distract or stimulate participants (e.g. they may sit on an exercise bike while chatting).</p> | <p>Behavioural reframing</p> | <p>Mistrust</p> <p>Lack of perceived relevance</p> |
| | <p>Roles: In some cases, roles are traditional (e.g. expert / novice) but as many pairings are not made to solve specific problems, participants may take on a range of different roles as conversations progress. This requires being open to unexpected opportunities.</p> | <p>Open mindedness</p> | <p>Limitations of emotional information processing ability</p> <p>Low self-efficacy</p> <p>Poor proximity / propinquity</p> |
| | <p>Norms: Regular social norms are partially challenged. The uniqueness of the experience allows participants to “be themselves” rather than necessarily performing to their</p> | <p>Authenticity</p> | <p>Lack of privacy</p> <p>Lack of legitimacy</p> <p>Inappropriate form</p> |

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|---|--|--|---|
| | job title for example. | | |
| | Objective: Each pair and every participant may have a different objective for taking part. In some cases there is a practical need to be met (e.g. help with a problem) and in other cases simply a curiosity to be satisfied. What all individuals share is a desire to leave more informed, inspired or enlightened. | Individual's purpose (not that of the organiser) | |
| | Routines: The regular sequence of events required to establish a connection is positively facilitated by matching participants prior to their arrival. Removes challenge of finding someone with whom to connect. | Matchmaking | |
| <p>Social Cups are a product designed to help people to connect in networking settings. Imagine a silver champagne flute with no foot or stem and you have Kristina Niedderer's experimental "social cups" (Niedderer, 2007). What makes them social are the small hooks on the side of the cups which allow them to be clipped together. Due to its rounded base, a single cup will not stand on its own. However, when clipped together with two or more others, the cups stand perfectly well. If a</p> | Props: The social cups themselves are the most critical connectivity factor of this product. They are functional (users can drink from them) but they are also unique in how they otherwise function as they require cooperation if they are to be set down on a surface (e.g. table). | Engagement Uniqueness | Mistrust |
| | Roles: As well as the 'networker' role assumed by people in networking-type gatherings, social cups also give all participants the subtler role of 'collaborator'. It is in everyone's best interest to be willing to collaborate with others in order to be able to put their cups down. | Role disruption Collaboration | Lack of perceived relevance Poor proximity / propinquity Discomfort Lack of Legitimacy |
| | Norms: Social cups make it necessary for participants to place their cups unusually close to each other. They literally must be touching, breaking norms of personal space and creating discomfort due to potential contamination. | Intimacy | Inappropriate form |

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|--|--|--------------------|--|
| <p>person wants to put their cup down therefore, they are required to find two or more other people to connect to.</p> | <p>Routine: Regular routines are interrupted. When holding a typical wine glass, if a person wishes to enact a standard routine such as visiting the restroom or reaching into their pocket for business cards, they just need to put their glass down. With social cups, these routines are broken as a person first had to find someone to cooperate with.</p> | <p>Cooperation</p> | |
|--|--|--------------------|--|

3.1 Motives of human connectivity

The study of human motivation as it relates to the pursuit of human connectivity outcomes has a long history in various domains. Maslow (1943) included ‘belongingness’ as a fundamental human need, second only to basic physiological needs. In Self-Determination Theory, ‘relatedness’ (the need to belong) is identified as one of the three fundamental innate needs that motivates humans (Ryan & Deci, 2000). Motives from these frameworks focus on emotional outcome of belonging resulting from connectivity. Broader explorations of motives extend thinking to other types of outcomes. For instance, in their interpretation of human needs from a behavioural evolutionary perspective, Aunger and Curtis (2013) identify 15 distinct motives, namely: lust, hunger, comfort, fear, disgust, attract, love, nurture, hoard, create, affiliate, status, justice, curiosity and play. Examples could be identified for the application of many of these 15 motives for a given connectivity experience. For example, considering one of the sampled interventions presented in Table 1, a person might be motivated by lust (seeking to find a lover), hunger (seeking food) or curiosity (seeking interesting conversations) to attend Wok+Wine.

In order to design for improved human connectivity, the true and complete understanding of a person’s motives in the setting in question is required, including how such motives link to the individual’s desired outcomes. In all cases, the motives may be relevant in a range of applications. Thus, we do not try to specify some discrete set of motives here for connecting but rather seek to emphasise the need to explore many possible motives for connecting that can lead to emotional, cognitive and practical outcomes. The motives employed and means of embodiment may also differ according to the human connectivity phase in focus.

3.2 Enablers of human connectivity

Features of design interventions that promote the creation of a connectivity phase or make the completion of such a phase more efficient are called enablers. Having identified the features of the behaviour setting dimensions that enhanced the likelihood of people connecting (Table 1), we generalised the nature of the enablers and ascribed them labels. Generalised enablers were then grouped according to their function (Table 2). Four functional categories of enablers emerged: those that *disrupt expected patterns*; those that *build trust*; those that *stimulate interaction*; and, those that *provide inspiration*.

Table 2. Enablers of human connectivity

| Function of Enabler | Label | Generalised description |
|---|---------------------------|---|
| Enablers that disrupt expected patterns | Unique roles | Having users take on a new or different role to the one they would usually take in such settings. |
| | Unique environmental cues | Choosing a setting that is different to that which users might expect. |
| | Unique behaviours | Ask users to engage in behaviours that are different to what they would usually engage in. |
| Enablers that build trust | Collective discomfort | Help users to venture safely, as a group, outside of their comfort zones. |
| | Authenticity | Encourage users to 'be themselves' rather than expecting them to conform to a pre-determined role. |
| | Open mindedness | Create conditions in which users may be curious and explorative, accepting all views and perspectives. |
| | Purpose set by individual | Avoid focusing users' attention on a single outcome that is the priority of the organisation rather than their own. |
| | Intimacy | Create safe environments in which users may get closer to each other, physically and emotionally. |
| | Neutral territory | Select settings that do not invoke incorrect assumptions or give any individual or group the upper hand. |
| | Shared experience | Ensure that all users feel that they are 'in the same boat'. |
| Enablers that stimulate interaction | Transparency | Be open about the process. Invite users 'behind the scenes' to witness the creation of the experience. |
| | Engagement | Allow all users to participate. Do not discriminate in favour of or against any one group. |
| | Behavioural prompts | Visual or physical prompts that suggest and permit the desired behaviour. |
| | Cooperation | Include interventions or activities that require people to work together. |
| Enablers that provide inspiration | Matchmaking | Connect users to each other so they don't have to find connections on their own. |
| | Environmental cues | Use the environment to provoke users and provide inspiration stimulates conversation. |

3.3 Barriers to human connectivity

Features of a system that hinder connectivity are called barriers. Although there is limited extant literature focused explicitly on barriers as they relate to human connectivity, a broader review of relevant (mainly psychology and organisation studies) literature provides useful insights. Here, we summarise two key categories of barriers that emerge from a review of the literature, namely psychological and physical barriers (Table 3). Psychological barriers stem from the beliefs that a person has about their ability to connect to others, as well as their general beliefs about the person with whom they might connect and the relevance or value of that connection. Physical barriers refer to aspects of the physical environment that may hinder the process of connecting.

Table 3. Psychological and Physical Barriers to Human Connectivity

| Psychological Barriers | Description | References |
|---|--|--|
| Fear of rejection | Being afraid that the other person will turn down one's attempt to connect with them. | (Downey & Feldman, 1996) |
| Negative ingroup/outgroup biases | Avoiding or treating with suspicion a person who does not appear to one's own group, often perceiving them as having less value. | (Castano, Yzerbyt, Bourguignon, & Seron, 2002) |
| Mistrust | A person is generally likely to trust close connections more than people who are less familiar or strangers. | (Wu, Leliveld, & Zhou, 2011) |
| Lack of perceived relevance | Misunderstanding or underestimating the value of people with whom one is less strongly connected. | (Granovetter, 1973) |
| Limitations of emotional information processing ability | Suggests a limit to the number of people with whom a person can maintain connections. | (Dunbar, 1998) |
| Low self-efficacy | Using past experience in order to form expectations about future success due to ability or lack thereof. | (Jones, 1986) |
| Mental energy | Limited capacity to dedicate energy to forming a connection when engaged in another activity. | (Fayard & Weeks, 2007) |
| Physical Barriers | | |
| Poor proximity / propinquity | Proximity to others has a significant effect on the likelihood of connecting and the strength of connection between them. | (Allen, 2007) |
| Lack Privacy | When there is no space that affords a sense of privacy, people are less likely to open up. | (Bernstein & Turban, 2018) |
| Discomfort | Feeling uncomfortable in a setting reduces the likelihood of connections forming effectively. | (Fayard & Weeks, 2007) |
| Lack of Legitimacy | The setting fails to afford people a sense of legitimacy for being there. | (Fayard & Weeks, 2007) |
| Inappropriate form | The form of an object may reduce connectivity potential or increase effects of social isolation. | (Blumenthal, 2007) |

The identification of motives, enablers and barriers of human connectivity provides a foundation for a more human-centred design approach to the creation of new interventions that focus on one or more of the phases of the process of connecting, to consistently deliver improved human connectivity outcomes.

4 Design for connectivity: a research agenda

The four phases of the human connectivity process (Figure 1) provide a framework on which to propose an agenda for further research. Although sometimes overlapping, each phase presents a set of unique challenges for which a human-centred design approach may deliver meaningful solutions (Table 4).

Table 4. Designing for human connectivity: challenges and research questions

| Connectivity phase | Key challenges | Possible research questions |
|---------------------------|--|---|
| Finding | <ul style="list-style-type: none"> The best source of relevant connections Sorting / sifting / selecting | <ul style="list-style-type: none"> How are peoples' most valuable connections initiated? What are the most effective approaches / platforms / techniques for finding relevant |

| | | |
|-------------|--|---|
| | <ul style="list-style-type: none"> Identifying unexpected valuable connections | <p>connections?</p> <ul style="list-style-type: none"> What is it about the design of those interventions and techniques that makes them so effective? What mindset characteristics best prepare someone to discover unexpected connections? What factors, including trends, are positively or negatively impacting peoples' ability to find relevant and meaningful connections? What routes to connectivity exist and how are these embodied in design interventions? |
| Forming | <ul style="list-style-type: none"> Connecting with outgroup others Understanding the factors that most influence the likelihood of connection formation | <ul style="list-style-type: none"> What factors most contribute to the likelihood of connections forming and the speed at which they form? How do the enablers and barriers to forming human connectivity differ across personal and professional contexts? How formed must connections be in order for them to be leveraged and is this different for different types of connection or forms of value? |
| Maintaining | <ul style="list-style-type: none"> Network size / overload Connection atrophy | <ul style="list-style-type: none"> What factors impact the ease by which connections may be maintained? What effect does digital technology have on (perceived) connection strength and longevity? Under what circumstances are connections terminated and how is this generally achieved? What (if any) are there benefits of managing network size, including terminating connections? |
| Leveraging | <ul style="list-style-type: none"> Recognising and realising value in unlikely connections Old vs new connections Reciprocity of exchange Authenticity-Value trade off | <ul style="list-style-type: none"> What factors increase the likelihood of connections being leveraged and what facilitates this process? Is leveraging mostly considered to be a one-way or reciprocal exchange? In the case of one-way leverage, what is the experience of the 'helper' vs the 'helpee'? To what extent does extracting value from a connection influence perceived authenticity? |

Additional general research questions include:

- How and to what extent do human connectivity needs and the motives to satisfy those needs change over time and by life stage?
- What are the design principles that effectively guide in the creation of interventions (experiences, services, products, systems) that improve human connectivity outcomes?
- To what extent are design principles for human connectivity generalisable across settings?

5 Conclusion

It is clear from a study of the extant literature that human connectivity is an important societal challenge that affects much of the world's population. From national governments to commercial organisations to individuals themselves, many institutions, organisations and people have a vested interest in finding solutions. Despite this, relatively little dedicated attention or effort has been paid to the evidence-based design of experiences, systems, services or products that have the explicit aim of improving human connectivity outcomes. While examples do exist of interventions that are meant to connect people, little is understood regarding what specific design decisions or principles lead to their success or failure. Subsequently, our understanding of how their effect may be generalised to other initiatives or settings is insufficient. Taking a more intentional and prescriptive approach to the design of interventions that directly or indirectly improve how people find, form, maintain and leverage connections to each other has the potential to positively affect the lives of millions of people. Only by more fully understanding the connectivity needs and motives of people as well as the enablers and barriers that support or prevent connections being made may we begin to take an effective human-centred approach to the design of more effective interventions.

The experience of human connectivity is subjective, and the realisation of an outcome is often not immediate. As such, measuring the effectiveness of existing and new interventions remains a challenge. That said, with this paper we have taken a first critical step in addressing this challenge. We have hereby placed design for human connectivity on the design research agenda. Rather than simply taking a descriptive approach to understanding how connected people feel as the result of experiencing certain interventions and what the implications of that are, we suggest taking a more prescriptive approach to include connectivity-related factors in the conception of new interventions. By dividing the process of connectivity into four distinct phases, acknowledging that the value derived from connections may take multiple (emotional, cognitive and/or functional) forms, and identifying the factors that affect the likely success of achieving desired connectivity outcomes, we have provided a way to focus attention on specific aspects of the process. The ideas presented in this paper are particularly relevant for the designers of experiences and systems intended to foster human connectivity and researchers seeking to better understand the nuances of this increasingly important field. The suggested research questions present a starting point for future research that should focus not only on deepening our understanding of the factors that affect human connectivity outcomes, but also on the relevance and respective weighting of those factors across a range of different settings.

We acknowledge that there is still much work to be done. While the motives, enablers and barriers identified here are grounded in extant literature and real-world interventions, the lists presented in the various tables of this paper are by no means exhaustive. The nuanced differences present in a range of other settings must be better understood for the development of truly generalisable design principles. Human connectivity is a challenge in almost all settings where people interact. While people in different settings may appear to have very different needs, the fact that those needs are limited in number and their pursuit is driven by a limited set of motives suggests that they may in fact have more in common than we think. Ultimately, a better understanding of key factors across a variety of settings will assist in the identification and prescription of a universal set of design principles that – when

applied to the design of interventions meant to connect people – may consistently improve the likelihood of achieving successful human connectivity outcomes.

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About the Authors:

Peter Mandeno: PhD candidate, Imperial College London. Peter's research focuses on design for improved human connectivity outcomes, inspired by more than a decade of work in industry designing experiences and other solutions to help individuals connect across cultural, professional and societal boundaries.

Dr. Weston Baxter: Assistant Professor, Imperial College London. Weston leads the Intentionality Group in Design Engineering with a focus of developing design theory and methodology relating to design for behaviour change and user experience design.