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Co-design with marginalised people: designers' perceptions of barriers and enablers

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ABSTRACT

The base of the world income pyramid, typically known as the Base of the pyramid (BOP), represents low-income people living in developing countries. Co-design with BOP people is crucial for sustained adoption and use of products and services. Based on interviews with practising designers, we identify barriers and enablers that the designers encounter in undertaking various tasks in the process of co-designing with these marginalised people. The findings suggest that a broad range of factors, related to the BOP context, co-design processes and methods, organisational issues, and aspects of collaboration, support or hinder activities in the co-design process. Consideration of these factors, as perceived by the designers, can lead to more impactful co-design with BOP people.

1. Introduction

The base of the world income pyramid, typically known as the Base of the pyramid (BOP), represents low-income people living in developing countries. In line with many studies, including recent ones, we define the BOP people as those living on less than 4 USD a day (e.g. Prahalad and Hart 2002; Jagtap 2019a). The total BOP population is about four billion, and the largest share of the BOP segment is in Asia (e.g. Jagtap, Larsson, and Kandachar 2013; Hammond et al. 2007). The BOP people often face major challenges in satisfying basic needs, and lack access to basic facilities, such as education, security, safe drinking water, sanitation, public health, and infrastructure (e.g. Aranda Jan, Jagtap, and Moultrie 2016; Prahalad 2004).

Design is indispensable to satisfy unmet or under-served needs of BOP people (Papanek and Fuller 1972). Appropriately designed products and services (e.g. frugal innovations) can contribute towards human and social development of BOP individuals and societies (e.g. Schumacher 1973; Jagtap 2019a). Such products and services include, for example, smokeless cookstoves, agricultural tools and equipment, systems providing access to energy, water and sanitation facilities, educational products and services, programmes supporting entrepreneurial activities, programmes raising awareness about environmental issues, or any other products and services that support development of BOP people (e.g. Aranda Jan et al. 2016; UNDP 2008; Jagtap 2019b).

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Much of the academic literature on design of products and services is anchored in advanced economies and relatively affluent regions. In contrast, very little is known about design in the context of BOP societies. The economic gap and the considerable socio-cultural divide between BOP societies and developed countries or relatively affluent areas in developing countries suggest that factors determining product success are significantly different across these contexts (Aranda Jan et al. 2016; Prahalad 2004; Jagtap, Larsson, and Kandachar 2013). Co-design with BOP people is a key determinant of product success in the BOP context (Jagtap 2019b). Products and services that are externally designed, without involving BOP people in design activities, fail to address a variety of constraints and requirements in BOP communities (e.g. Thomas 2006a; Jagtap and Larsson 2018; Nieusma 2004; Dodson, Sterling, and Bennett 2012). Such remotely designed products fail to create positive impact on the lives of BOP individuals and communities. Co-design is essential to enhance adoption and continued usage of solutions by BOP people.

The process of co-designing with BOP people includes several tasks such as planning to involve them in the design project, undertaking co-design activities with them, managing their ongoing and continued involvement, etc. (Jagtap and Larsson 2018). As such, in this paper, we refer to co-design with BOP people not only as actual interaction between designers and BOP people but also as accomplishment of various tasks in the co-design process. These tasks can be about planning for the involvement of BOP people in the design project, managing their continued involvement in the project, and making use of knowledge and insights gleaned from co-design activities.

Whilst co-design is a key determinant of product success in BOP communities, most of the extant research into co-design has focussed almost exclusively on non-BOP contexts from Western economies and relatively affluent regions (e.g. Sanders and Stappers 2008; Vargo and Lusch 2004; Grönroos 2011; von Hippel 2005; Prahalad and Ramaswamy 2004). These works, while valuable in their own right, have provided limited insight into the issues of co-design in BOP communities which may be typically new and unfamiliar contexts for most design professionals (Jagtap 2019a). Therefore, research into co-design in BOP contexts, with an emphasis on identifying factors that support or hinder co-design of products and services with BOP people, is needed. In view of these knowledge gaps, this research aims at identifying barriers and enablers that designers encounter in accomplishing various tasks in the process of co-designing with BOP people. Knowledge on these barriers and enablers can help in developing tools and methods to support designers in undertaking activities in the co-design process. In order to address the research aim, we carried out a qualitative analysis of data collected through interviews with designers in India, who have experience of co-designing with BOP people in India. Thus, the identified barriers and enablers are the designers' perceptions of factors supporting or hindering co-design with the BOP people in India.

Following this introduction, the rest of this paper is structured as follows. Section 2 reviews various accounts of using design to support and enhance life conditions of BOP people, explains the crucial role of co-design with BOP people, and highlights the need of undertaking co-design research in the BOP context. Section 3 presents the research methodology, providing details of sampling, data collection, and data analysis. Sections 4 presents findings gleaned from qualitative analysis of data collected through interviews

with designers. Finally, Section 5 discusses the findings, together with concluding remarks and limitations of the present research study.

2. Co-design and base of the pyramid

Design is indispensable to satisfy unmet or under-served needs of BOP people (Papanek and Fuller 1972). Appropriately designed products and services can contribute towards human and social development of BOP societies (e.g. Schumacher 1973). Such products and services include, for example, smokeless cookstoves, agricultural tools and equipment, or any other products and services that support development of BOP people (e.g. Aranda Jan et al. 2016; Jagtap 2019a). Such products and services are also known as frugal innovations designed for BOP people (Zeschky, Widenmayer, and Gassmann 2011; Jagtap 2021).

The concept of using design to improve life circumstances of BOP people can be traced back at least to the 'Appropriate Technology' and 'Design for the Real World' movements, articulated in the 1970s (Schumacher 1973; Papanek and Fuller 1972). The concept of 'Appropriate Technology' was initially formulated by the economist E.F. Schumacher, and was a basis for his well-recognised book 'Small Is Beautiful'. The 'Design for the Real World' movement was initiated by Victor Papanek, an industrial designer. Papanek's movement was aimed at motivating designers to develop solutions to fulfil needs of people in the Third World. Papanek's proposal was unique in the 1970s when most of the designers in the industrialised world were involved in designing products for non-BOP consumers (Amir 2004).

In Schumacher's and Papanek's movements, the role of non-governmental organisations (NGOs) in undertaking design activities is recognised (Jagtap 2019a). On the other hand, the role of for-profit companies is evident in Prahalad's Base of the Pyramid (BOP) concept. In 1998–1999, C. K. Prahalad and his colleagues, proposed that companies can raise their profits and alleviate poverty on a large scale (Prahalad and Hart 1999; Prahalad and Lieberthal 1998). Companies can tap BOP markets by selling appropriately designed products and services, leading to a win–win situation – making profits and satisfying needs of BOP people. There are many reasons why companies pursue BOP markets (Nakata and Weidner 2012). The BOP is the most significant and unaddressed global market. Collectively, BOP consumers hold assets worth valuing 9 USD trillion (Hammond and Prahalad 2004; London and Hart 2004). It has been argued that BOP individuals are aspiring consumers (Prahalad 2004). Furthermore, products and services specifically developed for BOP markets can be adapted and sold in middle- and high-income markets across the globe, creating additional benefits for businesses (Govindarajan and Trimble 2012).

Whilst the role of companies is emphasised in the Prahalad's BOP concept, these companies typically work with local NGOs to undertake design activities (Jagtap 2019b). NGOs, with their local knowledge and network, engage in co-design activities with BOP people (e.g. Rivera-Santos and Rufín 2010; Teegen 2003; Jagtap and Larsson 2013). Just as the role of NGOs in undertaking co-design activities with BOP people is recognised in Schumacher's and Papanek's movements and the Prahalad's BOP approach, it is recognised in several other approaches discussed using names such as 'community

development engineering', 'humanitarian engineering', 'design for development', 'frugal innovations', etc. (e.g. Jagtap and Larsson 2018).

The constraints, deprivations and socio-cultural characteristics of BOP societies are distinctly different from those in middle- and high-income societies (Prahalad 2004; Aranda Jan et al. 2016). Therefore, products and services designed for BOP societies must address unique circumstances and requirements in these societies. However, designers are often unfamiliar with the BOP, as they typically lack the experience of living in these societies and are detached from subsistence conditions in their daily lives (Jagtap et al. 2014). To support their design process, a deeper understanding of the target context is required. In particular, it is necessary to co-design products and services with BOP people to maximise acceptance and adoption of designed solutions by the BOP (Jagtap 2019a).

Products and services which are designed outside the BOP context, either in developed countries or in affluent areas of developing countries, have minimal impact on their acceptance. Designs that are externally conceived and simply implemented in the BOP fail to achieve sustainable adoption and impact (e.g. Nieusma 2004; Thomas 2006a; Murcott 2007; Dodson, Sterling, and Bennett 2012). Some authors argue that for sustainable impact on BOP communities, co-design activities are crucial, with a significant need to look beyond technological aspects of design to BOP communities and their context (Jagtap 2019b). Co-design is beneficial for both designers and BOP consumers. It enhances designer's understanding of the local setting and environment in which the eventually developed products and services will be used. Co-design supports designers in gaining insights into the needs and preferences of BOP people, their aspirations and life circumstances (Sethia 2005). In addition, co-design is valuable for BOP people. It empowers them for existing as well as future participatory activities, and can potentially enhance their design capability. Moreover, BOP people develop a feeling that the design project belongs to them, supporting their project ownership. Co-design, with its non-paternalistic and collaborative nature, ensures effective customisation of solutions to the local context (e.g. Jagtap 2019b). Many authors have called for co-designing with BOP people at every phase of the design process and for continuous learning from them (e.g. Murcott 2007). Given the profound need and importance of co-design with the BOP, several authors have highlighted a critical requirement of developing BOP-specific co-design methods and tools that are based on practitioners' experiences of co-designing products and services with BOP people (e.g. Aranda-Jan et al. 2016). More recent studies have also highlighted the urgent need of undertaking research into co-design in the BOP context (Jagtap 2019a; Nahi 2016).

However, extant research on co-design has been undertaken predominantly in middle- and high-income markets in developed countries or relatively wealthy regions of the world (e.g. Kleinsmann and Valkenburg 2008; Pirinen 2016). The idea of co-design in these markets is rooted in a long tradition of design and innovation research on customer participation (e.g. Nahi 2016). Since the late 1970s, many businesses have attempted to access external knowledge by involving their customers in design process (Sanders and Stappers 2008), and several studies in non-BOP segments have examined co-design, cocreation, lead-user innovation, and Nordic participatory approaches (e.g. Vargo and Lusch 2004; Grönroos 2011; von Hippel 2005), and have explored factors influencing co-design in non-BOP contexts (e.g. Kleinsmann and Valkenburg 2008; Widmark et al.

2011; Kleinsmann, Valkenburg, and Buijs 2007; Vaajakallio et al. 2013; Pirinen 2016). Co-design studies in non-BOP markets have highlighted benefits of co-design such as increased productivity and enhanced customers satisfaction (Lee, Olson, and Trimi 2012; Prahalad and Ramaswamy 2004). Using suitable methods and tools, co-design enables effective engagement between designers and consumers, alleviating knowledge differences that can exist between them (Sanders and Stappers 2008). In the context of middle- and high-income markets, researchers have developed co-design methods and tools such as cultural probes and generative tool-kits using a range of stimulus items such as pictures, videos, narratives, etc. (Sanders 2000; Gaver, Dunne, and Pacenti 1999). These studies, while valuable in their own right, have yielded limited insight into co-design in BOP societies which are distinctly different on many dimensions from middle- and high-income societies. Co-design with BOP people is under different circumstances than co-design with customers from developed countries (e.g. Hussain, Sanders, and Steinert 2012).

As compared to middle- and high-income societies, co-design research in BOP societies has been given little attention. A few studies have dealt with co-design in such BOP societies. Some studies have indicated that co-designing with BOP people improves product acceptance and adoption (e.g. Ssozi-Mugarura, Blake, and Rivett 2017; Champanis and Rivett 2012). Other studies report on co-design activities. For example, Thomas (2006a) has reported on a project, involving participatory approach, aimed at developing an aid to reduce physical efforts of washerwomen. In a similar fashion, Ssozi-Mugarura, Blake, and Rivett (2017) elaborate on participatorily designed ICT intervention, Nieusma and Riley (2010) report on co-design workshops used in the development of a renewable energy system in a rural area, and Hussain, Sanders, and Steinert (2012) describe a field study where co-design activities were used to generate ideas for a prosthetic device for children in Cambodia. Whilst co-design with BOP people has been discussed using various labels, it is typically interpreted as a process in which designers and BOP people work together to co-design products and services to generate value (e.g. Eyles et al. 2016; Gonzalez, Divigalpitiya, and Sakai 2017; Jagtap 2019a). In the BOP context, some authors have emphasised that the co-design process includes a number of activities including, among others, planning for involvement of BOP people, engaging in co-design activities with them, managing their ongoing and continued involvement in the project, implementing their feedback gained during co-design activities, etc. (e.g. Jagtap and Larsson 2018). Such activities are essential in the co-design process, and practitioners typically consider them as a part of co-design with BOP people (e.g. Jagtap and Larsson 2018). Studies in the BOP context have not identified barriers and enablers that practitioners encounter in the co-design process.

3. Research methodology

A number of design studies have employed interviews as a research method to investigate a broad range of topics, covering many design sectors (e.g. Cross and Cross 1996; Busby and Lloyd 1999; Herring et al. 2009; Jagtap and Johnson 2011). In this research, an interview study was undertaken to qualitatively investigate barriers and enablers that designers encounter in co-designing with BOP people. The details of sampling

procedure, data collection, and the ways in which the collected data were handled and analysed are discussed in the paragraphs that follow.

As mentioned in Section 2, NGOs are valued as important partners in a variety of approaches involving design of products and services for addressing needs of BOP societies, and they play a key role in co-designing with BOP people. In this research study, by employing direct communication and chain referral sampling, 18 participants from the NGOs in India were recruited (e.g. Bryman 2004; Jagtap 2018). The participants were recruited if they had experience of co-designing with BOP people. The participants were drawn from 16 organisations with experience of designing products and services in the context of BOP societies. The participants are henceforth referred to as 'designers' due to their roles and design activities. They typically held bachelors or masters level degrees relevant to their work, with significant professional experience – ranging from 7 to 29 years. Overall, they have worked in a broad range of capacities on projects from numerous sectors such as housing, healthcare, water, sanitation, and agriculture, covering both rural and urban areas (see Table 1). They have co-designed a wide range of products and services such as smokeless cookstoves, toilets, housing for slum-dwellers, irrigation systems, devices working on solar energy, agricultural tools and equipment, programmes for enhancing awareness about environmental issues, training and marketing plans for women entrepreneurs, etc.

Of the eighteen participants, three participants have formal training in design (participants Deepa, Pankaj and Mukesh in Table 1 – these are pseudonyms). The remaining 15 participants do not have formal training in design. Whilst they are not formally trained in design, they have experience of working on projects aimed at addressing problems faced by the BOP people, involving design activities such as problem

Table 1. Information on the participants in the study.

Participant	Educational qualification	Gender	Sector	Professional experience (years)
Deepa	Masters	Female	Housing, sanitation	26–30
Pankaj	PhD	Male	Energy, agriculture, design education	26–30
Mukesh	Masters	Male	Energy, agriculture, design education	11–15
Deepak	Bachelors	Male	Water and agriculture	6–10
Anup	Masters	Male	Water conservation, irrigation, science education, appropriate technology	16–20
Harsh	Masters	Male	Women entrepreneurship, healthcare, environmental issues	11–15
Nitin	Masters	Male	Agriculture	6–10
Raghu	Bachelors	Male	Agriculture	6–10
Rohit	Masters	Male	Water and sanitation, energy, lighting	21–25
Samir	Diploma	Male	Water and sanitation	11–15
Dinesh	Masters	Male	Dairy, agriculture	16–20
Disha	Bachelors	Female	Agriculture	6–10
Anil	Bachelors	Male	Healthcare	21–25
Sachin	Bachelors	Male	Urban planning	6–10
Neha	Bachelors	Female	Healthcare, women empowerment	11–15
Rahul	Bachelors	Male	Environmental awareness	16–20
Kapil	Diploma	Male	Vocational training	16–20
Raja	Masters	Male	Energy, agriculture	26–30

understanding, generation of alternative solutions, evaluation of solutions, etc. As mentioned above, they have significant professional experience of working on such projects. All the 18 participants are born and raised in India. Their country of residence is India. The participants typically live in urban, semi-urban and rural areas (RBI 2001). The participants in the study have co-designed with a diversity of BOP people. They have co-designed with both men and women, from diverse age groups (e.g., adults, elderly). The participants in the study have worked with BOP people from both rural and urban areas, and these BOP people are born and raised in India. In order to maintain confidentiality, the participants, their organisations, and the projects they discussed are not mentioned in this paper.

Excepting one designer, all the remaining designers were interviewed individually at their place of work. This allowed informal observation of their practices and working culture. The mean duration of these eighteen semi-structured interviews (e.g. Gray 2013; Breakwell 2006) was approximately 70 minutes, excluding briefing and debriefing. Prior to each interview, a standard two-stage process of seeking informed consent was followed. The designers consented first to participate in the interview study. In the second stage of the consent process, they gave a separate consent to audio-record the interview for later transcription and analysis. With permission, each interview was thus audio recorded.

The designers were asked to recall experiences of projects in which they co-designed with BOP people, and to explain the design process that they employed. The discussions focussed on their own role and role of others in the projects, goals and outcomes of the projects, and experiences of employing specific methods and techniques in co-design activities, including their benefits and weaknesses. Furthermore, the discussions focussed on nature and challenges of involving BOP people in the design process, including matters that support and hinder co-design activities. The participants were allowed to express both positive and negative experiences. Based on the participants' responses, successive exploring questions were asked. All interviews were carried out in the language 'Marathi'. In all interviews, the researcher used the terms that were employed by the designers to refer to 'co-design'. The designers used a broad range of terms to refer to co-design such as – 'designing with people', 'designing by taking people along', 'designing by people-participation', 'people-involvement in design', 'co-design', and 'participatory design'. Whilst the participants having formal training in design used terms such as co-design and participatory design, others used more descriptive terms and language (e.g. designing with people, designing by taking people along, etc.).

Audio recordings of all interviews were transcribed verbatim for iterative analysis process based on a general inductive approach (e.g. Thomas 2006b; Gray 2013). The transcribed interview data in Marathi were analysed with the aim of identifying barriers and enablers that designers encounter in co-designing with BOP people. The data analysis was content-driven, with the aim of identifying occurrences of these barriers and enablers. Initially, the transcripts were read carefully, and occurrences that could be interpreted as barriers and enablers in co-designing with BOP people were highlighted in the transcripts. All explicitly and implicitly implied or mentioned barriers and enablers were taken into account. Next, these barriers and enablers were categorised taking into account their resemblance, resulting into

broader level categories. In general, a category was considered when there was support for it from multiple participants, while combining marginal categories into others. After several rounds, the analysis stabilised on the main categories of barriers and enablers that are presented further in this paper. The categorisation of these barriers and enablers was intended to signify the participating designers' view. In presenting findings, we have included quotations drawn from the transcripts of interviews to support or exemplify the offered account. The quotations included in the paper are translated into English after the analysis of interview data. These quotations are edited for clarity and for supporting readers for ease of understanding. Any additional information in the quotations is included in square brackets. At the end of each quotation, a participant pseudonym is included; for example, Sachin refers to the participant Sachin in Table 1. These names are not participants' real names. They are replaced by pseudonyms to maintain anonymity.
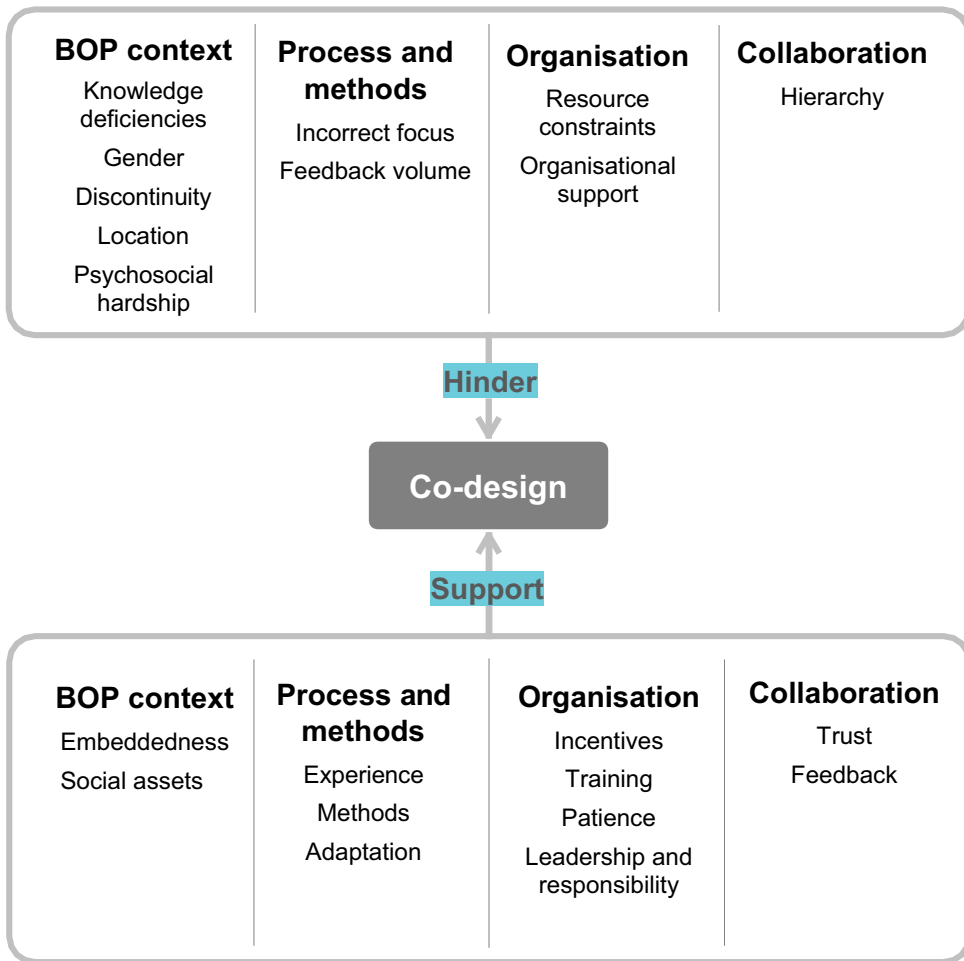
Figure 1. Factors influencing various activities in the process of co-designing with BOP people.

4. Findings

Figure 1 shows the barriers and enablers that the designers encountered in co-designing with BOP people. Of those factors that support various co-design tasks, two of them relate to BOP context (embeddedness and social assets), three relate to process and methods (experience, methods, and adaptation), four relate to organisational aspects (incentives, leadership and responsibility, training, and patience), and two relate to the issues of collaboration (trust and feedback). Of those factors that hinder various co-design tasks, five of them relate to BOP context (knowledge, gender, discontinuity, location, and psychosocial deprivation), two relate to process and methods (incorrect focus and feedback volume), two to organisational aspects (resources and organisational support), and one relates to aspects of collaboration (hierarchy). The following sections present the details of the above barriers and enablers.

4.1. BOP context

Five barriers and two enablers of co-design relate to the BOP context, and are presented in the following sections.

4.1.1. Barriers – BOP context

The barriers, namely, knowledge deficiencies, gender, discontinuity, location, and psychosocial deprivation, relate to the BOP context.

4.1.1.1. Knowledge deficiencies. The BOP people's unfamiliarity with design activities was described as having a limiting effect on their participation in design projects. The BOP people's limited knowledge of design processes and of generation and evaluation of requirements and alternative solution concepts was considered as an obstacle in co-designing with them. Negative consequences of this were well known, manifesting in the form of project delays or limited involvement of BOP people in co-design activities. In projects that were considered as complex and technology-intensive, the BOP people were involved primarily in identification and evaluation of needs. In such projects, their participation in generation and evaluation of conceptual solutions was virtually absent, and was attributed to their low literacy levels, innumeracy, and limited design knowledge and experience.

> 'I think they [BOP people] don't know about how projects are planned and how we proceed through various design stages … Of course, we understand that this is because of their lack of related knowledge. And some of them also do not get a chance to complete their primary or secondary education. I think this delays projects and … their contribution also gets hampered when we work with them.' — Deepak

4.1.1.2. Gender. The designers in this study spoke of difficulties that they encountered in co-designing with women from BOP communities. Whilst involving men in co-design activities was seen as relatively easy, involving women was considered challenging. This was typically attributed to gender-based norms and cultural factors, which restricted equal participation of men and women in some activities. Participatory activities in mixed-gender groups may not be appreciated due to gendered power relations and

associated heterogeneity in BOP communities. The designers mentioned that women were silent and did not actively engage in co-design activities undertaken in mixed-gender groups.

> '*I feel it is reasonably quick and easy to involve men in design tasks. When you compare [with the involvement of men] ... I think it is somewhat difficult to involve women in projects. I guess this is perhaps due to our ways of working as a society or maybe because women don't have much time ... their work-burden seems to be high.*' — Rahul

4.1.1.3. Discontinuity.

The designers referred to inconsistent participation of BOP people as an influence on their participation in design projects. The designers cited several reasons for their irregular participation including, among others, their nature of work and family commitments. Their irregular hours of work in informal sector, pressing need to find casual work, and sickness were deemed as contributing factors to their inconsistent participation in design activities. Discontinuity in their participation was considered as having several problematic effects. For example, since many BOP people could not participate in all the co-design activities, they could not contribute throughout the design process. When they missed some design activities, their engagement in further activities was less effective.

> '*Well, people may work with us initially, and they might find some work, somebody in the family might get sick, and ... they may miss some other group activities. I think this happens.*' — Rahul

4.1.1.4. Location.

Some of the designers cited difficulties in involving people from remote villages in design projects. Involving BOP people from urban, semi-urban and accessible villages was considered relatively easy because gaining access to people from these locations and organising their continued participation in design projects was considered to be manageable. In contrast, involving people from remote communities and villages was seen as problematic because of difficulties in accessing their locations and resources required to manage their participation in design projects. When people from such location were involved in design projects, it was only for a few sessions and for gathering of information on problems they encounter in their daily lives.

> '*Our work is just in this district, we visit these villages and we have good rapport with the people there. We have rarely worked with the small communities on the other side [in a difficult to access area] ... you know our work is limited in that sense.*' — Dinesh

4.1.1.5. Psychosocial hardship.

The designers in this study mentioned that some BOP people were at unease during co-design sessions, and did not contribute to the planned activities. They were perceived as nervous and low in confidence during their interaction with the designers. Socio-cultural and knowledge differences that might exist between BOP people and designers were speculated as a contributing factor behind their low confidence. Some of the designers referred to uncertain income of BOP people, their ill health, and constant stress and social isolation that they experience as having an influence on their behaviour during co-design activities, with an inhibiting impact on their contribution to design projects.

'Sometimes they seem to be nervous, anxious in these [participatory design] activities ... I can infer that from their behaviour during our interactions. I think they don't look confident sometimes. I think this happens especially when they are participating in such [co-design] sessions first time even when we try hard to make it as friendly, informal as possible. Maybe they think they don't know much.' — Raghu

4.1.2. Enablers – BOP context

Two enablers, namely, embeddedness and social assets, relate to the BOP context.

4.1.2.1. Embeddedness. The designers mentioned that becoming an integral part of a BOP community is a means by which they could effectively involve BOP individuals in design projects. The designers also described that BOP people perceive locally embedded organisations which work with them on regular basis as a part of their community, and not as an outsider. Local embeddedness was claimed essential to gain an in-depth understanding of needs, aspirations, and socio-cultural strengths of the community. Local embeddedness was described as crucial in planning appropriate projects aimed at addressing pressing needs of the community, while saving time and effort required in gaining access to BOP individuals, in persuading them to participate in project activities, and in managing their ongoing involvement in the projects.

'We have worked in that village a lot, in many projects ... they know us and we know them very well. It is like we are part of that community and I feel they think like that. I think this has taken time, but it helps us now ... we can easily work with them, quick to involve them in various stages.' — Samir

4.1.2.2. Social assets. The designers referred to some aspects of social context in BOP communities to successfully undertake co-design activities. The tendency of BOP communities to pursue shared objectives with mutual support was valued for its beneficial influence on their participation in design projects. The designers mentioned that BOP individuals support each other in a broad range of matters and rely on their social networks for information and collective activities. These attributes of social context were considered highly useful in spreading information on new projects as well as in facilitating their contribution to a broad range of participatory activities not only in design phase of a project but also in implementation of the designed solutions.

'They might be poor in terms of money but I think they are very rich in social connections in their communities. Information spreads very fast ... when we want to include them in projects or arrange some participatory activities, spreading information is quick.' — Deepa

4.2. Process and methods

Two barriers and three enablers of co-design with BOP people relate to process and methods. They are presented in the following subsections.

4.2.1. Barriers – process and methods

The barriers, namely, incorrect focus and feedback volume, relate to process and methods.

4.2.1.1. Incorrect focus. Weak engagement with the BOP people was also associated with the misalignment between their needs and aims of the projects. The designers in the study referred to projects that were primarily driven by the goals of clients and donor organisations, resulting into narrow focus on areas that were irrelevant for satisfying pressing needs of BOP communities. This was prominent in some technology-driven projects, aimed at testing applications of specific technologies in BOP communities. The BOP people could not participate effectively in such projects in which there was no direct connection with their needs and problems. They were not intensely dependent on the outcomes of these projects.

> *'People don't participate when the project does not make any sense to them. I think the project must start from what they are looking for … otherwise, it is forceful application of some-thing.'*— Anup

4.2.1.2. Feedback volume. The designers mentioned that they received a great volume of feedback in projects that were considered by the BOP people as highly beneficial. The designers described difficulties associated with handling large amount of feedback that they received in such projects. Sorting outcomes of co-design activities based on their value and recognising which outcomes are useful for the project were seen as difficult tasks. Selecting appropriate results that can add value to the project was deemed time-consuming and labour-intensive activity. The designers referred to their lack of capacity to appropriately implement promising outcomes of co-design activities in order to gain from the efforts that they devoted to co-designing with BOP people.

> *'Sometimes it is just easy to include them in various design stages … and this is the case when they like the work, they think they will get something from it. It is easy to include them. And then you get a lot of feedback. Unfortunately, we don't have that much capacity to … we are just not able to deal with that [feedback].'* — Dinesh

4.2.2. Enablers – process and methods

Three enablers, namely, experience, methods, and adaptation, relate to process and methods.

4.2.2.1. Experience. With experience of participatory design activities in BOP communities, designers develop an understanding of what works and what does not work in co-designing with BOP people. The designers in the study described that their accumulated co-design experience was beneficial in identifying obstacles in participation of BOP people, and was also valuable in implementing strategies to overcome those obstacles. The designers also mentioned that they could effectively co-design with BOP individuals who had prior co-design experience, suggesting that co-design experience also helped BOP people in their participatory design activities.

'They [farmers in a village] have worked with us many times. I am sure they know very well about design activities. We don't need to explain the basics to them now … it saves time, it is easy for them and for us.' — Disha

4.2.2.2. Methods. The designers often described the use of suitable methods as a means to effectively engage BOP individuals in participatory activities, alleviating knowledge and socio-cultural differences that might exist between them and BOP people. Pictographic ways of communication using pictures, drawings, and sketches were praised as a method by which designers could convey complex ideas and concepts, permitting BOP individuals to comprehend the concepts and share their thoughts and ideas with the designers. Just as pictographic communication was seen as an effective method to engage with BOP people and to create shared understanding between participants, so too were the narrative ways of communication using concrete explanation and examples, without using abstract discussions.

'We describe them the plan or how they might use it or other things using simple drawings, sketches of plans, pictures … anything that helps us to explain them. And then you know, once they know what we are talking about, they get involved and tell us ideas and what they like and dislike.' — Deepa

4.2.2.3. Adaptation. General attributes of co-design methods were previously described as having an influence on participation and contribution of BOP people in design activities. Adapting co-design methods and procedures to the requirements and conditions of a given project was also claimed necessary to involve BOP people in the project's design activities. The differences between goals and anticipated solutions of various projects meant that the designers needed to adapt methods and strategies to gain access to BOP people, to maintain their continued participation, and to facilitate their contribution to design activities such as requirements identification and idea generation.

'You know our work is very much project based. We have worked on a lot of projects. Some are similar, but I think there are always some important differences between them. We use some tactics to plan involvement of people depending on the project … you just can't use same tactics to work with them in all projects.' — Kapil

4.3. Organisation

Two barriers and four enablers relate to organisational aspects, and are presented in the following subsections.

4.3.1. Barriers – organisation

The barriers, namely, resource constraints and organisational support, relate to organisational aspects.

4.3.1.1. Resource constraints. A recurring theme in the interviews was the availability of resources in the organisations to effectively involve BOP people in the design projects. Budget-constraints were described as having a negative effect on gaining access to BOP

people, on organising and managing their ongoing participation, and on facilitating their contribution to design activities. Limited resources were also thought to give rise to breaks in the projects, leading to inefficient and ineffective accomplishment of co-design activities. The designers mentioned that they could not involve a broad range of BOP people deemed to be essential for the projects. This was attributed to the human resources and funding available in the organisations. Limited resources and budget were also described as having an effect on methods and tools used to engage with BOP people in participatory activities, e.g. constraints on using high-fidelity prototypes to gain feedback from BOP people.

> 'There is cost involved in participating them in design work. You have to plan it, contact them, you have to manage the participation, and you need to use models or mock-ups if you want them to understand it very well … it needs a lot of money, you know. We do with what we have
>
> … *we just can't do everything when we design with them.'* — Anup

4.3.1.2. *Organisational support.* Some of the designers referred to organisational support as having an effect on the involvement of BOP people in design activities. Organisations supporting participation of BOP people in design activities were appreciated. On the other hand, those organisations in which participation of BOP people in projects was not given priority were seen as discouraging co-design activities. Settings in which there was lack of interest and commitment, co-design activities might be carried out just for demonstration.

> *'There [participant referring to another organisation where he worked in the past] also I involved people in design activities. But they [the previous organisation] always thought they knew all the things and what people needed … they saw participatory design as unnecessary. They thought it [participatory design] was waste of time, and … you know they didn't support it.'* — Pankaj

4.3.2. *Enablers – organisation*
Four enablers, namely, incentives, training, leadership and responsibility, and patience, relate to organisational aspects.

4.3.2.1. *Incentives.* Incentives were thought to trigger interest and influence continued participation of BOP people in design work. The designers mentioned that incentives motivated BOP people to know more about the planned project and stimulated their participation. Such incentives influenced BOP people's willingness to share information. The projects that mattered to the BOP people and on which they were intensely dependent to satisfy their urgent and critical needs were also claimed to encourage their participation. Some of the designers mentioned that appropriate projects, targeted at pressing needs of BOP communities, are authentic incentives driving BOP people to participate, to share information, and to contribute towards exploratory and creative activities.

> *'Many times, I see that when the project is something that matters to them a lot or when they are very much dependent on its outcomes, then they get really interested and they contribute throughout the project … I think a kind of real incentive for them.'* – Raghu

4.3.2.2. Training. The designers frequently insisted that training was a necessary means by which they could facilitate the involvement and contribution of BOP people in co-design activities. Appropriate training programmes were deemed essential to address BOP people's lack of knowledge about the process of designing solutions. The designers mentioned that they tailored the training programmes to local conditions and specificities of the target communities, while taking into account aspects such as educational level and age of BOP individuals. In addition to training BOP people, the designers mentioned that training relevant staff in their organisation is also essential to effectively involve BOP individuals in design activities.

> 'Everybody in our organisation is not exposed to working with the people, especially when they are new or have just started their work in this field. We do train them informally about this … just sharing our experience of working with the people. I think it is good if they are trained in planning and design, I mean different steps and so on … it is good, it helps.' — Kapil

4.3.2.3. Leadership and responsibility. The designers mentioned that there is a need of an actor in the organisation who takes responsibility for leading and managing co-design processes and engagement with BOP people. Motivation, charisma, and skills of such an actor were described as having a large influence on the involvement of BOP people in design activities. A co-design leader was expected to formulate project goals, assign clear roles, and continuously monitor co-design activities, while taking responsibility for implementing co-design outcomes.

> 'We are fortunate, our founder is a very systematic person, he believes in working closely with the people, he has always encouraged this kind of participatory design … I think that is something what is needed to involve people throughout the project.' — Nitin

4.3.2.4. Patience. The designers insisted that patience is central to involve BOP people in design projects. Working with BOP communities was considered to take more time than anticipated because BOP people have several pressing duties with greater priority than participation in design activities. The designers mentioned that they needed to be patient when they involved BOP individuals in design activities, and found a way to move at their pace. Taking a longer-term view was considered essential to work with BOP people and for building trusting relationships with them.

> 'It is surely good to design with them, and you know it takes time. You can plan and set some deadlines, but you must not be rigid … it can be slow to work with the people, they have other work also.' — Raja

4.4. Collaboration

One barrier and two enablers of co-design with BOP people relate to the issues of collaboration. They are presented in the following subsections.

4.4.1. Barriers – collaboration

One barrier, namely, hierarchy relates to the issues of collaboration.

4.4.1.1. Hierarchy. In design projects that were targeted at both BOP and non-BOP people, hierarchy in the society was a barrier in effective involvement and contribution of a broad range of participants. In such projects, those who were wealthy, were having authority, or were considered as knowledgeable, were dominating the discussions, steering design projects to match their desires, preferences or ideologies. Such skewed discussions, attributed to hierarchies in the society and among those participating in design projects, have problematic effect on contribution of BOP people to design projects, making them as mere audience in co-design activities. Hierarchies, power structures, and the resulting unequal participation of BOP and non-BOP individuals were seen as leaving no space for BOP people to speak and express their views in common design tasks.

> *'In some participatory design sessions, in some projects, we have involved people from all layers, like middle class, people with job, people without a job, or very poor people… people from various layers. You know we have many layers like this. And, you can guess what happens*
>
> *… people with job, money, education capture the session … I mean they leave very little scope for the poor.'* — Sachin

4.4.2. Enablers – collaboration

Two enablers, namely, trust and feedback, relate to the issues of collaboration.

4.4.2.1. Trust. The designers repeatedly described significant role of trusting relationships with BOP communities in co-design activities. When BOP people trusted the organisations, they willingly participated and shared information. Transparency in the organisation's operations and conduct both within and outside the BOP communities was expected to contribute towards building trusting relationships with BOP communities. The designers mentioned that clear articulation of aims and potential benefits of the project, without withholding any critical information that BOP communities need to know, is associated with trust building and effecting engagement with BOP people. Whilst developing trusting relationships is difficult for a new organisation, they can be developed and maintained by embarking on co-design events and participatory activities with BOP communities, changing their attitude towards organisations.

> *'It is very good when they [BOP people] trust us. And when there is trust, it is easy to work with each other. In past projects, I have experienced that they are open to give information and comment on the design without any hesitation when they believed in the project and trusted our goals and our team.'* — Nitin

4.4.2.2. Feedback. Offering feedback to BOP people on how their participation and contribution to previous design work helped shape the project was considered to influence their interest in future participation. When BOP people were aware about successful impact of projects in which they participated, their willingness to participate in new projects or to contribute consistently towards ongoing projects was seen as being strengthened. In addition, results of successful projects encouraged new participants to engage in ongoing projects.

'We tell them how their inputs and how their comments and opinions were useful in the design work, and ... how that helped in getting the results of [the project]. I think you have to do it ... I think they feel appreciated. Of course, this helps in new projects ... once they know that their inputs, opinions are valued, they participate willingly.' — Deepak

5. Discussion and conclusions

Co-design with BOP people is an important approach to designing solutions that satisfy their unmet or underserved needs. Co-design helps designers in accomplishing a range of design activities. Co-design empowers BOP people for participatory activities, supporting their project ownership. The findings from the interviews with the designers revealed a broad range of factors affecting various tasks in the process of co-designing with BOP people. The designers described a number of factors as obstacles or as having a limiting effect on gaining access to BOP people, on managing their regular participation, or on facilitating their contribution to design activities. The designers also mentioned many factors that were thought to trigger interest of BOP people in co-design or were valued for their beneficial influence on effective involvement and contribution of BOP people in co-design tasks. As such, the designers encountered a wide range of organisational, contextual, collaboration-related, and process-related barriers and enablers in co-designing solutions with BOP people (see Figure 1). Next subsection discusses these barriers and enablers.

5.1. Co-design barriers and enablers

Some aspects of BOP context such as BOP people's low literacy level, limited design knowledge, pressing need to find an income source, their conditions of living under constant stress and sickness, and gender-based norms in their communities were deemed as factors hindering co-design activities. Designers perceived these contextual aspects to contribute towards BOP people's inconsistent participation in co-design activities, their lack of confidence during their interaction with the designers, or unequal participation of men and women in co-design activities. Whilst some aspects of BOP context were considered as co-design barriers, other aspects, such as local embeddedness and tendency of BOP communities to pursue shared objectives, were considered as co-design enablers. For example, social networks of BOP individuals and their tendency to support each other facilitate their involvement in design activities.

Some aspects of processes and methods, such as misalignment between project-goals and needs (e.g. when BOP people considered the projects as irrelevant) were seen as having a limiting effect on BOP people's participation in design projects. Lack of methods to handle a great volume of feedback (e.g. when projects were considered as highly beneficial) was seen as having a limiting effect on identifying relevant and useful feedback. On the other hand, aspects such as use of pictographic and narrative methods of communication, adapting co-design methods to project specificities, and co-design experience, were deemed as supporting participation of BOP people in design activities.

Some organisational aspects, such as budget-constraints, limited resources, and absence of commitment to co-design activities, were deemed as co-design barriers. On the other hand, the following organisational aspects were considered as co-design

enablers: incentives, allocation of responsibility to someone in the organisation to lead and manage co-design activities, suitable training programmes, and patience to move at the BOP people's pace. Just as some organisational aspects were thought to support or hinder co-design with BOP people, so too were aspects associated with collaboration. For example, hierarchies and power structures in the society and among those participating in design projects were deemed as affecting collaboration, with problematic effect on co-design activities. In contrast, trusting relationships with BOP communities and offering them feedback on their fruitful participation were thought to support co-design activities.

5.2. Power imbalance between designers and BOP people

Effective participation of users in design projects can be hampered by gender and illiteracy related issues. Such issues can lead to power imbalance between users and designers. The barriers about 'gender' and 'knowledge deficiencies', as identified in this research study, can be interpreted as contributors to imbalance of power between BOP people and designers. For example, the findings suggest that BOP women may not express their views and opinions in mixed-gender groups or they may not participate consistently in all co-design sessions. Compared to men, work burden of BOP women is higher. They need to work for income-generation, for example, in informal sector or in agricultural activities. In addition to these income-generation activities, they also need to carry out household work, including cooking, fetching water from distant sources, collecting firewood, taking care of children and elderly in the family, etc. This may not give them enough time to engage in co-design activities; or when they engage in such activities, they may not be able to participate in all co-design sessions. In addition, there can be biased allocation of resources against girls and women in households. For example, girls may face many problems in getting both primary and secondary education. As a consequence, they suffer from higher level of illiteracy and innumeracy. This can further lower their self-esteem. All such factors exacerbate power imbalance between designers and BOP women, with negative consequences on BOP women's contribution to co-design activities.

It should be noted that of the 18 designers in the study, 15 are men and three are women. The women designers did not mention gender-related barrier. This suggests that when codesign activities are conducted by a female designer, BOP women's participation may be effective. Conducting separate codesign sessions for men and women may also support BOP women in freely sharing their views and opinions in participatory activities.

In addition to the gender-related power imbalance, the barrier about knowledge deficiencies of BOP people can potentially contribute to power imbalance between them and designers. The barrier 'knowledge deficiencies' is about BOP people's limited knowledge of design activities and design processes. This knowledge related power imbalance can be interpreted as a manifestation of socioeconomic, educational and knowledge differences between BOP people and designers. BOP people may not get an opportunity to complete their primary and secondary education, resulting into low literacy level, innumeracy, and limited design knowledge. As mentioned by the designers, the enabler 'training' can be used to address knowledge deficiencies of BOP people. Suitable training programs can support BOP people in addressing their lack of design knowledge. Training programs can also be developed to enhance their participation in

technology-oriented projects. It is important to train not just BOP people, but also designers to alleviate their knowledge deficiencies in how to effectively engage BOP people in codesign. Whilst designers spoke of BOP people's knowledge deficiencies regarding design knowledge, they appreciated social assets of BOP communities, including their tendency to pursue common objectives and share knowledge through social networks. Such social assets can alleviate power imbalance between BOP people and designers.

5.3. Using enablers to address barriers

The findings of this research study suggest a need to balance factors supporting co-design against factors hindering co-design. This balancing of supporting and hindering factors can be for each of the four categories (i.e. 'BOP context', 'process and methods', 'organisation', and 'collaboration'). This is exemplified as follows for these four categories. In the category 'BOP context', the barrier discontinuity can be addressed by leveraging social assets. For instance, when a BOP individual cannot participate in some co-design sessions, he or she can learn about those sessions from other BOP people who participated in those sessions; thus, building on the tendency of BOP people to share information and pursue shared objectives. Likewise, social assets might be used to train BOP people in design activities, overcoming their related knowledge deficiencies. For example, trained BOP people can educate and train other people in the community to enhance their design knowledge and skills. Furthermore, embeddedness in remote villages can potentially support organisations in co-designing with BOP people from remote locations, and thereby in alleviating the barrier 'location'. In a similar vein, embeddedness in BOP communities can alleviate issues related to psychosocial hardship, supporting BOP people to easily engage in co-design activities with the designers.

In the category 'process and methods', adaptation of methods or development of appropriate methods can support designers in processing large volume of feedback that they might receive in some projects. Likewise, development of methods can support clients and donor organisations to recognise misalignment between BOP people's needs and project goals or to propose projects that target pressing needs of BOP people.

In the category 'organisation', the barriers about the lack of organisational support can be addressed by assigning someone in the organisation a role to lead and manage involvement of BOP people in design projects. The barrier about resource constraints can be alleviated by training staff in the organisation to effectively and creatively use available resources for gaining access to BOP people, for managing their ongoing participation, and for facilitating their contribution to design activities. The staff in the organisation can be encouraged or offered incentives to effectively use available resources or to develop novel ways for involving BOP people in projects within the constraint of available funding and human resources.

In the category 'collaboration', the barrier about hierarchy can be addressed by offering feedback to the participants. For example, designers could ask for feedback from participants regarding skewed discussions (if any) and the resulting marginalisation of BOP people in co-design tasks. This can assist participants to support each other in contributing towards co-design activities.

5.4. Implications

This study identified factors influencing co-design with BOP people. Our findings can help designers in gaining a deeper appreciation of a wide range of factors supporting and hindering involvement of BOP people in co-design activities. The study offers insights into co-design enablers that designers can employ or leverage to support their co-design attempts. The findings about co-design barriers can usefully support designers in devising suitable coping strategies. Our findings also permit recommending actions that can usefully support prescriptive research in this field. The findings can provide an initial basis for developing tools and methods to support designers in their efforts of co-designing solutions with BOP people. The findings provide numerous opportunities to develop such co-design aids; for instance, researchers might usefully focus on targeting specific co-design barriers through the development of suitable methods and strategies. For example, because men and women living in BOP societies differ in their needs and views about problems (e.g. Jagtap 2019a) and because involving women in co-design activities was described as a barrier, researchers can aim at supporting designers with gender-sensitive co-design methods and tools. Prescriptive research studies can also aim at developing co-design toolkits that can support designers in holistically addressing various barriers. These toolkits can also take advantage of co-design enablers. Co-design methods and tools can also be co-developed with designers and other related stakeholders.

Beyond holding potential implications for practice and research of design in this field, the findings presented here might usefully support design education in this field. Over the past decade, interest in design within this field has grown, with several universities and institutes offering design courses in this field and providing opportunities for students to work on design projects in the context of BOP societies (e.g. Jagtap 2019a). As such, the co-design barriers and enablers identified in this research can support training and education of design students. For instance, the findings can assist students and their supervisors in anticipating potential obstacles that students can encounter in co-designing with BOP people, supporting them to better plan their design projects. For example, projects involving co-design activities with BOP people might need more time as there is a need of moving at BOP people's pace, and this aspect should be considered in project planning.

5.5. Limitations and further research

As with any research, this study has some limitations, providing opportunities for future research in this field. Although the retrospective method of interviews has some limitations (e.g., designers' ability to recall events), it allowed gleaning data from designers working in a broad range of sectors. Further studies can gain from using real-time methods such as ethnographic participation, shadowing, or observations (e.g. O'reilly 2004). Future studies might also benefit by focussing on co-design activities, interactions, and meetings between designers and BOP people. Such activities and meetings provide opportunity to record what is said by the designers and BOP people, permitting researchers to capture their interactions for further analysis. Whilst this study benefited from using qualitative inquiry, future research might benefit from employing

quantitative approaches, such as experiments, questionnaires, etc. (Frankfort-Nachmias and Nachmias 1996), or from employing both qualitative and quantitative approaches to portray an inclusive and comprehensive picture of co-design in this field (e.g. Tashakkori and Teddlie 1998).

Some particular aspects of our study should be taken into account in generalising the findings and planning for further research. For example, the designers studied were from non-governmental organisations in India, and they have co-designed with the BOP people in India. Designers working in other countries and in other types of organisations can experience co-design barriers and enablers in different ways. Furthermore, co-designing with BOP people in other countries can be under different circumstances. As such, future studies may gain by focussing on various features of design practices, including types of organisations (e.g. NGOs, companies, social enterprises, etc.) and countries where co-design activities are undertaken. In particular, future studies might be carried out in a range of countries in the 'least developed' group from the Development Assistance Committee's categorisation of countries (DAC 2019). These above differences can reveal factors affecting co-design in various settings, permitting comparative analysis for identification of factors that affect co-design across contexts or those that are applicable to specific contexts. One of the limitations of this research study is that the identified co-design barriers and enablers are based on interviews with the designers. Therefore, these barriers and enablers are the designers' perceptions of factors supporting or hindering co-design with the BOP people. Therefore, future studies can gain by investigating BOP people's co-design experiences and their perceptions of factors influencing co-design activities.

To summarise, this research study has explored some important aspects of co-design in the context of BOP societies, making important contribution towards the design literature. Based on interviews with the designers, the study revealed a broad range of organisational, contextual, collaboration-related, and process-related barriers and enablers in co-designing solutions with BOP people. While the study is exploratory in nature, it has generated design knowledge in a field that has received little research attention and appears to be geographically and psychologically remote for many practitioners, students, and academics. Further design research is clearly needed to better understand co-design in this field. We hope that our work will encourage other researchers to join us in investigating how to co-design solutions with BOP communities around the world and in supporting this long ignored and worthy socioeconomic context.

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