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Connecting female migrants to healthcare systems through smartphone apps: An asset-based design case study translating social capital of community organisations into sociotechnical systems

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Abstract

Workers in community organisations in Amsterdam and Bogota daily use smartphones for personal reasons. However, smartphone apps have been outside their organisational reach. Thus, our paper explores sociotechnical systems' opportunities to bridge community organisations and female migrants to macrosystems such as healthcare systems. Our selected community organisations, Casa Migrante in Amsterdam and Kilombo Yumma in Bogota, were born out of serving peer migrants from Latin American and Afro-Colombian backgrounds. Their services provide support to female migrants who suffer abuse and poverty. Built on cultural practices and social structures of their own, these organisations live on the periphery of macrosystems. They struggle to be appreciated and integrated into macrosystems and digital networks. Thus, our paper highlights the core of their services, using asset-based design, and translates their social capital into sociotechnical systems such as smartphone apps. This is intended to reveal, consolidate and integrate their efforts into wider systems.

Keywords: Community organisations, Female migrants, Smartphone apps, Asset-based design, Sociotechnical systems, Sociotechnical capital

Introduction

Supporting the harsh realities of newly arrived low-income migrants are community organisations. Migrants carry a heavy burden, as they tend to be seen as people taking advantage of opportunities offered by the host countries or cities or as a threat since their presence downgrades the quality of life in neighbourhoods where they settle or brings petty crime to an area (Ryu & Tuvilla, 2018). This creates a general unwelcoming narrative around low-income migrants.

Additional burdens include the expectation from hosting systems that these migrants will be able to stand on their own feet with some limited support, such as language courses or subsidies (Ryu & Tuvilla, 2018). Migrants' abilities to thrive depend on multiple factors, such as strong ties to local networks, institutional entities, labour skills or legal immigration status (Biswas et al., 2012). Due to these internal and external barriers, migrants suffer from significant vulnerabilities, isolation and mental health issues (Hou et al, 2020; Standing, 2011; Syed, 2016).

In the case of female migrants, they fall into the category of 'inferior' workers, involving low-skilled and low-wage labour (Phizacklea, 1983). Their labour conditions impede them from looking for health services in a timely manner. In the Netherlands, migrants avoid seeking healthcare services due to fear of deportation or high financial costs (Van Walsum, 2016). In Colombia, although all citizens are entitled to free access to care, the amount of paperwork and complexity of the public healthcare system make women withdraw from using it. In both cases, the lack of timely access to healthcare services increases health inequity.

Allowing migrants to navigate unfamiliar places occurs with smartphones. These are a lifeline to low-income migrants in the Netherlands, as they help them to stay connected to their loved ones and find their way in new cities. They also allow safety and connectivity, plus sending money to their loved ones in other countries (Alencar et al., 2019; Mazzucato et al., 2008).

The pervasiveness of smartphones, even in low-income populations, has enabled apps such as Tarjimly (https://www.tarjimly.org/) and Shifra (https://shifra.app/en) to provide healthcare information to migrants and translation services. However, limited smartphone apps exist that connect community organisations, migrants and healthcare systems. This phenomenon can be partially explained as small and underfunded organisations suffering from the "organisational digital divide" (McNutt, 2008). This phenomenon refers to the lack of limited organisational information communication tools, which hampers their ability to connect to wider systems and to prove their effectiveness in working with migrants in macrosystems (Riza et al., 2020).

Thus, we ask, how are the services and related challenges of our selected community organisations in Bogota and Amsterdam? How do they establish connections to macrosystems such as the healthcare system? How can smartphones support community organisations in connecting female migrants and healthcare systems? What are the distilled principles for guiding the development of smartphone apps for these community organisations?

Our main contribution is to characterise the services of our selected community organisations. Next, we explore the role of smartphone apps in enhancing those services towards healthcare systems, by distilling principles that respect the sensitivity of female migrants' situations and the social capital and possibilities of community organisations.

Theoretical lenses

We selected sociotechnical systems, sociotechnical capital and collaborative services theories to support our study.

Sociotechnical systems

The term sociotechnical system alludes to the human–machine intricate components found in small-scale devices such as smartphones or large objects and infrastructure such as public transport, the internet or any other technology-based product. The socio part involves people and users, and the technical part is the machine or technologically based aspects (Ropohl, 1999).

Sociotechnical systems are highly embedded in modern life, and society cannot function any longer without them (Edwards, 2003; Ropohl, 1999). Digital sociotechnical systems have achieved high pervasiveness; thus their absence or failure in functioning creates a significant disruption in work and personal life (Amir & Kant, 2018).

Although sociotechnical systems are modelled out of human activities, they impact human relations and interactions permanently. This is because, at the core of sociotechnical systems, the premise is to socialise technology, as well as technical social interactions (Ropohl, 1999). Thus, the human and societal aspects of sociotechnical systems are to be closely considered.

Taking sociotechnical systems' implications into consideration is sociotechnical capital. This concept takes the social capital of communities, understood as social interactions, relations, and motivation to connect

and act together, as the base to transform them into sociotechnical relations. Therefore, sociotechnical systems substitute social structures and interactions of users, intending to enhance their social fabric through technology/machine possibilities (Robison & Siles, 2002).

Furthermore, sociotechnical capital explicitly challenges the assumption that sociotechnical systems such as information communication technologies (ICT) increase people's abilities to act together by simply having them. Instead, sociotechnical capital proposes to use social capital to promote adoption and expected benefits (Resnick, 2001).

Building further on social capital are collaborative services (Baek, et al., 2018). Where services are built out of the capital of human relations. They address social issues and build on social capital by increasing trust among communities, support and care. This capital contributes not only to the resilience of societies but also to social innovations (Manzini, 2007; Meroni & Sangiorgi, 2011).

Collaborative services create not only services but collaborative networks (Baek & Manzini, 2012). These collaborative networks can be explained since capital is something usually implied for high-income segments and yields. However, capital within social capital is the ability of groups to cooperate in horizontal ways within their networks, without hierarchical structures to stop them while creating improved outcomes for them, despite scarce resources (Robison & Siles, 2002).

These collaborative services are usually circumscribed in the culture and social institutions of communities, which makes them invisible to outsiders (Blomberg & Darrah, 2015). Thus, the role of service designers is to carve out those imperceptible services that are ingrained in community discourses and translate them into something new, yet highly recognisable to the community studied, respecting the central human condition, social capital and organicity of their interactions (Sangiorgi & Prendiville, 2014).

To summarise:

- Opportunities are created by digital sociotechnical systems such as smartphones and apps, which are widely used by migrants and community organisations.
- The imperative human and social capital requirements in designing sociotechnical systems, referred to as sociotechnical capital, enhance the capabilities of users such as migrants and community organisations.
- The potential of smartphone apps is to increase integration into macrosystems such as healthcare systems.
- Our role as service designers and design researchers is to carve out those invisible services, coined as collaborative services and next to translate them into smartphone apps to increase appreciation and clarity concerning their contributions to macrosystems and society at large.

Method

We selected three complementary methods for our study. The first is a literature review, which we used to introduce the selected community organisations and frame the problems around them (Creswell, 2014). The second is asset-based design (ABD), which is used for community design and builds on the cultural and social capital of communities (Pei et al., 2022). It differs in particular from human-centred design (HCD), which focuses on mitigating negative aspects of interactions with a focus on momentary functional requirements. HCD is argued to overlook social structures, leading to social and cultural exclusion (Vink & Oertzen, 2018; Wong-Villacres et al., 2020).

Particularly in designing digital sociotechnical systems, the focus should be on leveraging existing assets such as social capital and cultural practices, which are crucial assets for effective community digital interventions (Pei et al., 2022). Thus, ABD aligns well with the concept of sociotechnical capital proposed by Resnick (2001). Moreover, ABD seeks the identification of robust practices already developed by communities to be translated into interventions such as digital sociotechnical systems that fully represent those communities (Cho et al., 2019).

ABD proposes focusing on assets such as care, solidarity, social networks and local expertise (Wong-Villacres et al., 2020), variables selected for answering through our study. The approach is intrinsically participatory, as it intends to work with communities in co-creating their futures and mitigating social and technological inequalities (Wong-Villacres et al., 2021).

In the co-creation of those asset-based futures, we selected paper prototyping techniques as means to represent a service, where its usage and technical aspects become more apparent. Paper prototypes are seen as a means to illustrate smartphone app services and to crystallise the capital from community organisations (Sanders & Stappers, 2014). Thus, paper prototypes are a means of inquiry to shape the social technical capital of such community organisations (Koskinen et al., 2011).

For our data analysis, we selected inductive content analysis (ICA). This method abstracts data into groups to answer the research questions using concepts, categories or themes. ICA is used when the data collection process is open and follows loosely defined themes (Kyngäs 2020). For our inductive analysis, we used the asset variables introduced earlier by ABD of care, trust, solidarity and sharing resources to guide us.

Results

Responding to the vulnerabilities of female migrants are Casa Migrante in Amsterdam and Kilombos in Bogota. Kilombos were founded by Afro-Colombian women trained in African ancestral medicine. Their midwifery roles came along with leadership traits, which made them community leaders. After being displaced from their territory of origin, they founded ethnomedical organisations called Kilombos in Bogota. These provide safe health spaces for Afro-Colombian women and children. Reclaiming their bodily traditions through ancestral midwifery became a form of reclaiming their dignity (Gutiérrez Páez et al., 2017).

Casa Migrante was created by a Christian pastor aiming to support Spanish-speaking migrants mostly of Latin American heritage in Amsterdam, who were affected by language and cultural barriers. In brief, women working in prostitution suffered from significant abuse, and societal stigma knocked on their doors. Regrettably, female migrants working in prostitution are mostly unaccounted for in migration and diaspora studies (Agustín, 2006).

The Christian tradition encourages people to treat neighbours and foreigners with kindness and generosity, to look after the sick, feed the hungry, etc and devote oneself to the service of people in need (Kirillova et al., 2014; Laba, 1991)

Afro-Colombian beliefs have two roots: Catholic Christian tradition, imposed by the Spanish colonisers and sub-Saharan western African heritage. The latter has as its central premise the “ubuntu spirit”, which means “I am because we are” (Hamedani et al., 2012) and is expressed through the ideals of compassion, reciprocity and dignity to build and maintain a community with justice and mutual caring relations. This

strong level of collectivism is also perceived in their identity, which mostly comes from kinship and family ties such as “who I know”, and “what family and community I belong to” (Nussbaum, 2003).

These beliefs are in opposition to Protestant ones embedded in Dutch society and capitalist systems, in which the sooner a person is removed from the support of a mother, a community and religion, the more independent and self-reliant this person will become (Laba, 1991).

These beliefs have transcended religion and become part of neoliberal economic and political models in Colombia and the Netherlands, creating significant contrasts with our selected community organisations, whose beliefs and culture of collective support, care and sacrifice guide their existence, as our next method’s findings illustrate.

Asset-based design findings

In the next paragraphs, we present our findings per organisation, following the selected ABD variables of care, trust, solidarity and sharing resources. First, we present in Table 1 the summary of the description of co-creation sessions and include two photo collages.

Table 1: Description of the co-creation sessions.

	Casa Migrante	**Kilombo Yumma**
Number of co-creation sessions	1	1
Attendants	7	6
Profile	Female migrants, volunteers and personnel	Personnel: nurse, community health worker, healer, ancestral midwife, environmental technician and Matrona
Duration	120 minutes	90 minutes
Consent forms	Signed by all attendees	Signed by all attendees
Raw data	Post-its, notes, audio recordings, paper prototypes and photographs. All data stored in a secure server of Eindhoven University of Technology.	Notes, audio recordings, paper prototypes and photographs. All data stored in a secure server of Eindhoven University of Technology.
Attendees’ recruitment	Carried out by community organisation via social media and WhatsApp.	Carried out by community organisation face-to-face and via WhatsApp.

Casa Migrante

Care: Care happens at various levels:

1. Pragmatic
2. Personal

3. Emotional
4. Healing

1. *Pragmatic care: Language, cultural and process translation*
   Personnel and volunteers help female migrants access the healthcare system by making appointments for them, accompanying them to their appointments, translating from Spanish to Dutch and mediating during the appointment to ensure that the female migrant's articulation of her health needs is clearly understood by the physician and vice versa.

   The nurse volunteer mentioned that the translating services that Casa Migrante provides go beyond language and involve cultural aspects as well. When she joins someone at a healthcare appointment, she supports the migrant to define and voice her needs to the physician in question. Physicians in the Netherlands tend to ask people "What can I do for you?" which is a foreign concept to Latin American communities, who are not used to articulating their health needs assertively. Thus, for a female migrant having to do this on the spot with a stranger such as a physician is a difficult task where cultural guidance is required.

2. *Personal care: Own health last*
   Latin American female migrants tend to neglect their health. This is because they put the needs of others above theirs or because they lack health education and information or enabling conditions to seek healthcare services, such as flexibility at work or fear of deportation.

   Furthermore, some suffer from emotional and/or physical abuse, which diminishes their self-esteem and agency to act. In supporting these women to understand that they need to put themselves first, look after themselves and seek care, this self-awareness is a significant task of Casa Migrante. Workshops throughout the year take place to provide spaces to speak and discuss these abuse topics. Women are usually recruited via a WhatsApp message, and announcements are made via Facebook.

   One participant argued that she did not know that she had health issues. She went to the doctor since her boyfriend told her that she was gaining too much weight. It turned out she had thyroid issues. Now she takes medicine and supplements to manage it. Despite not being with that partner anymore, she has learned to look after herself, especially now that she is by herself in the Netherlands.

3. *Emotional care: Overcoming barriers to find own strength*
   Psychological, social services and doulas are offered to migrants at Casa Migrante. These services are provided during weekends and evenings to accommodate the working life of female migrants. However, the notion of mental health is also diluted for these women. It takes time and pondering for them to engage in therapy. Domestic violence and general abuse are prevalent subjects addressed by these services. The vulnerability of these women makes it hard for them to act on it.

   The doula volunteer at Casa Migrante argued that Latin American women that she sees at Casa Migrante have a lot of trauma and that pregnancy brings significant cultural clashes between Dutch and Latin American healthcare approaches, which ultimately make women not trust their bodies and themselves. In addition, the baby may not be intentionally conceived, creating greater anxiety in women. Thus, a large part of her work is to help these women trust themselves and their bodies.

4. *Healing care: Cohabiting together as a repairing act*
   Some of these migrants do not have stable homes to live in. This can be due to eviction, because women decide to leave their abusive partners or simply because they cannot find a home. Casa Migrante provides an open living room six days a week. After their opening time, 2 pm, people and women flock to the living room and lounge of Casa Migrante. Here they find peers in the same situation, they feel safe, and they have a warm place to be and food to eat. The open living room is the place where all the above care forms connect and cement and where warmth is experienced at an emotional repair level.

Care, therefore, is defined as a journey on which the personnel and volunteers of Casa Migrante embark with female migrants to teach them self-care. This means identifying their health needs, finding a voice within the healthcare system and larger systems, understanding their rights, meeting peers and acting upon their inner strengths. One female migrant argued that she has learned about the benefits of being part of a macrosystem. Currently, she pays for her healthcare insurance, which makes her feel good about herself and secure.

Trust: Next to language support and cultural translation, there is indefinite time and availability to accompany and listen to female migrants. Indefinite time is necessary to understand what they need and to build trust.

Solidarity, sharing resources
Sharing resources is a natural and embedded activity of Casa Migrante. These can be information, time, guidance, food, a living room, etc. In the open living room, people can easily connect and extend their network, acquaintances and peers, which leads to more emotional support and living opportunities for them.

Image 1: Photo collage from Casa Migrante co-creation session.

Kilombo Yumma
Care: Care at Kilombo Yumma happens at
1. Pragmatic
2. Physiological and emotional and
3. Spiritual levels

1. Pragmatic care: Accessing health insurance, removing bureaucratic obstacles
Kilombo Yumma helps female migrants realise the services of the national healthcare system for this population. The nurse and community health workers are trained to know how to manoeuvre the bureaucracy to issue health insurance for their population.

Pragmatic care involves removing the bureaucratic barriers to accessing the national healthcare services in Bogota. The personnel also create referrals, book appointments with health units and hospitals and, if necessary, join them in these appointments.

2. Physiological and emotional care: Complementing western medicine with ancestral midwifery
To Kilombos Yumma's personnel, western medicine is limited in supporting health since it is only approached from the physiological aspects. In their communities, when a woman gets pregnant, her role within the community varies. Having a baby is following an important milestone in the personal and emotional development of a woman, such as getting their period. These milestones also involve an emotional and communal transition that needs to be addressed, which is ignored by western healthcare systems. When women suspect they are pregnant, they consult matrons, midwives or healers to guide them in their process. This process is a journey where chants, massages, and tailor-made pregnancy advice are provided. All of it is aimed at making the woman feel safe, prepared and supported by her community in her transition.

However, ancestral midwifery also involves physiological aspects carried out by midwives. They ask questions and examine the pregnant woman. To be sure, they go through a list of risky conditions in pregnancy such as palpitations, beeping ears, headaches etc. Through their hands, the size of the belly and the position of the baby are checked. If they notice the baby is breech, they have different techniques to reposition him/her. All these practices provide comfort and safety to the population.

As midwives know their limitations, they are very comfortable leaning on nurses' expertise to complement their examination and to refer women with high-risk conditions in pregnancy to the national healthcare system. Women referred by Kilombos to the healthcare systems are closely followed up to ensure they are seen and understand the necessary treatment to be followed. They insist that their work goes beyond the symptoms. It is to guide and accompany women at a deeper level.

3. Spiritual care: Piercing through the soul of everyone in need
The Matrona from Yumma is very explicit about the spiritual care they provide to their population. She describes Kilombo's service as seeing through the eyes of people into their soul to fully understand the person in front of them to best support him/her.

Spiritual care is understood as taking the time to assess the family situation of that person by asking "Who do you live with, who works in the house or earns money, who do you look after, who looks after you and who is your support network?"

In this process sometimes, the female migrant is given a plant to look after. Kilombo's personnel intend to assess the well-being and ability of that person to look after herself and others. Thus, spiritual care is defined as picking through the soul of the person, revealing and assessing her emotional needs.

Solidarity: Connected to spiritual care is solidarity. A core part of their tradition is to heal through group rituals called "sanación", which translates as healing. Many female migrants who visit Kilombo Yumma are victims of war, which means they have been displaced by force and terror from their homes. They may have been raped by armed men. They have witnessed and lost relatives in the war. Thus, Kilombo Yumma is a place where literal and figurative healing takes place. Kilombo Yumma personnel get together around the woman who has been through a very difficult experience. They encircle her and through chants and calling out the inner strength of the person and collective support, they aim to help her to move on. This is accompanied also by active listening, which is a daily activity they carry out at Kilombo Yumma.

The Matrona expressed offence at the fact that the Secretary of Health does not understand nor distinguish between their ritual practices. Some are aimed at healing the person and others are aimed at getting the community in sync by holding hands and sharing their collective good intentions, good health and support.

Sharing of resources: Donations or other goods are something found at Yumma. This is because they are a central resources hub for the community for information, guidance, medicine and support. Many people tend to arrive by lunchtime since they know that the food will be shared. They say: “Where one eats, many can eat also”.

Paper prototype findings

Casa Migrante

The participants recognise their daily use of smartphones and selected apps such as Uber, maps, WhatsApp and calendars. However, they dislike apps with extensive data and complex navigation formats.

The main challenge Casa Migrante identified was the lack of digital tools to connect and coordinate female migrants to volunteers who want to support them. Currently, there is much back and forth between the personnel of Casa Migrante and female migrants before the volunteers get involved.

Thus, the idea of having an Uber service-type app for volunteers and female migrants was defined as essential to increase coordination and the number of female migrants being helped by Casa Migrante. The app would allow the Casa Migrante personnel to do less coordination and provide more social, legal, emotional and practical guidance to other female migrants. Furthermore, this app would fill upa gap in the Dutch healthcare system:

The nurse volunteer argued that in the past there were translators in hospitals to support people, which today do not exist anymore. Thus, the work of the volunteers becomes even more important to culturally and personally support the female migrant be understood and helped properly.

Introducing the app would be done by the Casa Migrante personnel, since the coordinator argued that once the relationship is established with Casa Migrante, female migrants feel comfortable being helped by any volunteer female to go to the doctor, as long as this person can speak Spanish.

Last but not least, the number of meetups between volunteers and female migrants is captured by the app and can be accessed by Casa Migrante. In this way, evidencing their effectiveness in connecting female migrants to Dutch healthcare would be possible.

Kilombo Yumma

All personnel from Yumma use smartphones daily. However, few of them are literate in using computers. They find the paper forms that they need to fill in from the Secretary of Health cumbersome and an extension of racial subordination from macrosystems to them. Thus, they want to have an app on their smartphones.

The purpose of the app is to support Yumma to collect data in easier and more empowering ways. The data variables to be collected need to be defined since they currently see that the paper forms do not represent their ancestral practices in culturally appropriate ways, which subsequently means their lack of representation within the national healthcare system and national data systems.

Thus, to Yumma any sociotechnical app aims to streamline data collection while acknowledging and increasing the representation of their ancestral practices.

Thus, the opportunities identified are:

A. Swift data collection instead of cumbersome forms
B. Representation of medicine and combined approach
C. "Ubuntu" of health
D. Impact through referral data

A. *Swift data collection instead of cumbersome forms*

Currently, they use several forms to collect data from the population to characterise them, their living situation and their health issues. These tasks are done by the Secretary of Health; thus Yumma is the data clerks Moreover, the forms take a long time to fill in, interrupt their flow of practices and affect the human connection, which aims to establish a "spiritual" connection.

B. *Representation of medicine and combined approach*

Kilombo Yumma has a western and ancestral medicine approach, provided by their multidisciplinary team including a senior nurse. Regrettably, the Secretary of Health and its forms undermine their ancestral medicine practices. Instead, there are general questions in the forms such as ancestral medicine next to acupuncture. In the eyes of Kilombo Yumma, this underrepresents them at the local and macrosystem levels. Thus, the smartphone app aims to collect their combined ancestral and western medicine practice as presented in Table 2 below. A limited selection of data fields was selected for this paper to illustrate the sociotechnical system opportunity.

Table 2: Selection of data fields to be included in their sociotechnical system.

Ancestral medicine data	*Western medicine data*
Is the baby well positioned in the belly?	Has the pregnant mother experienced any unusual symptoms?
Is the baby "boxed" in the belly?	Does the pregnant mother have pain down under the belly?
Has the pregnant female received ancestral advice?	Does the pregnant female have a headache?
Did the healer advise the pregnant female?	Does the pregnant female have to bleed?
Does the pregnant female have beeping sounds in her ears?	What is the pregnant female's foetocardia?
Does the pregnant female have blurry vision?	What is the pregnant female's blood pressure?
Are the ankles of the pregnant female swollen?	What is the pregnant female heart rate?

A. *'Ubuntu' of health*

To Yumma, the support network and living situation of female migrants is essential to understand and capture. In their view, when these aspects are not in place and the woman is pregnant, the outcome of the pregnancy will not be good. Lack of good nutrition leads to problems with the baby, to mention one thing. Thus, the questions to be included in the app are:

- Who do you live with?
- Who is your support health network?
- How many people earn an income in your family?
- Who takes care of you (financially and emotionally)?
- Who do you look after?

B. Referrals

Yumma creates many referrals to the healthcare system and other public instances. Thus, they would like to capture the type and number of referrals done monthly, as follows:

- National health insurance
- Subsidy claims
- Food
- Ambulance
- Birth at hospital

One of the main takeaways from the prototypes was the significant interest in creating lists of activities or symptoms in a smartphone app to which they could answer YES or NO to avoid interrupting their routines and rituals. Since they are a large team, their preference is that only one person completes the app, instead of all of them having to enter data, as happens today.

Image 2: Photo collage from Kilombo Yumma co-creation session.

Discussion

Mitigating structural gaps for female migrants to access the healthcare systems in Amsterdam and Bogota are Casa Migrante and Kilombo Yumma community organisations. Despite their deep care and significant efforts to help female migrants, the lack of appropriate sociotechnical systems impedes them from being appreciated beyond their communities.

Due to their type of work and sociotechnical systems' literacy, it was found important to introduce sociotechnical systems to these organisations and female migrants in smartphone apps. Those apps also should follow the features and logic of WhatsApp, Uber, Calendars or Anylist, which are familiar to them.

However, to ensure that sociotechnical systems are fully adopted and meet the core values and practices of these organisations, they should also follow the sociotechnical capital identified and presented next.

Sociotechnical capital principles for community organisations

1. *Jointly defining health needs for appointments to happen*: The identification of the health need is something that requires time and personal interaction with female migrants. Once the health need has been identified, a series of administrative activities comes to make the appointments happen. These are enabled and registered in the apps.

2. *Extending relations:* The more effectively the community organisations can do their work using the apps, the more relations and support are created for the female migrants. The natural horizontal navigation of their own and extended networks is enhanced through the apps.

3. *Feeling represented in large networks:* Naming and capturing their traditions in sociotechnical apps is crucial to create a better understanding and representation of these communities within the society they are part of but invisible to.

4. *Impact in numbers:* Finally, through the apps the select community organisations have immediate access to the activities and their total number is summarised. This can be displayed on their social media page, shared with macrosystems, etc.

The sociotechnical capital principles distilled through our study are built upon several complementary aspects of the social capital and services of the community organisations selected. This capital involves soft and hard aspects, such as defining a health need through active listening and having data (total number of activities) from their efforts. It is clear that for female migrants and community organisations such soft qualities in place enabled the hard ones to happen. Thus, this is replicated and visualised (Image 3). Without sociotechnical capital, the leap for these organisations to more digital and robust sociotechnical systems is questionable.

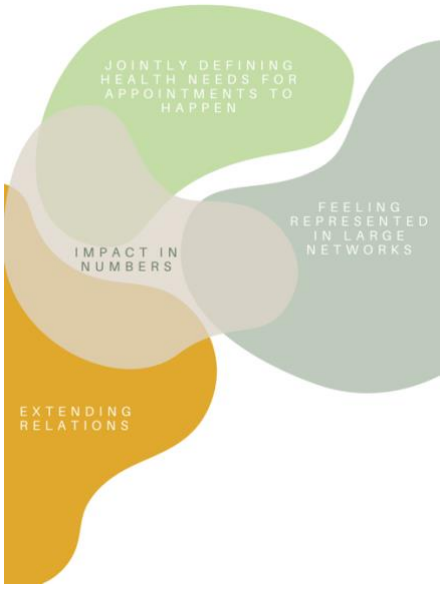

Image 3: Sociotechnical capital pillars for community organisations.

Through ABD and paper prototyping, we carved out the imperceptible services of community organisations in Amsterdam and Bogota. These methods enabled the service designers and design researchers to articulate sociotechnical capital for these organisations. However, these methods have limitations as follow-up is required to assess and further these opportunities for these organisations, which is outside the scope of this paper. These methods created enthusiasm in the community organisations as they opened an invisible door to them. However, without the external support of design and engineering teams, the materialisation of these opportunities continues to be far-fetched to them.

Conclusion

Female migrants from Latin American origin arriving in a new country such as the Netherlands and its capital city, Amsterdam or Afro-Colombian migrants from the Pacific coast arriving in Bogota experience significant social, cultural and bureaucratic barriers to accessing healthcare services. Helping them in navigating this complexity are community organisations. These organisations, however, suffer from a lack of sociotechnical organisational systems to support them in connecting female migrants and the healthcare systems. These organisations also suffer from a lack of visibility and electronic ways to prove their impact on macrosystems. Finally, their social capital and assets of care, solidarity and ability to support female migrants have not yet been captured in sociotechnical systems. Thus, through ABD and sociotechnical capital, we prototyped two digital apps for smartphones, aimed at cementing their core services of community organisations to amplify their services involving deep care for their communities while establishing bridges and ways to prove their efforts to macrosystems. To materialise these initial opportunities, further efforts within and beyond these community organisations are required.

References

Agustín, L. (2006). The disappearing of a migration category: Migrants who sell sex. *Journal of Ethnic and Migration Studies*, *32*(1), 29-47.

Alencar, A., Kondova, K., & Ribbens, W. (2019). The smartphone as a lifeline: An exploration of refugees' use of mobile communication technologies during their flight. *Media, Culture & Society*, *41*(6), 828–844.

Amir, S., & Kant, V. (2018). Sociotechnical resilience: A preliminary concept. *Risk Analysis*, *38*(1), 8–16.

Baek, J. S., Kim, S., Pahk, Y., & Manzini, E. (2018). A sociotechnical framework for the design of collaborative services. *Design Studies*, *55*, 54–78.

Biswas, D., Toebes, B., Hjern, A., Ascher, H., & Norredam, M. (2012). Access to health care for undocumented migrants from a human rights perspective: A comparative study of Denmark, Sweden, and The Netherlands. *Health and Human Rights*, *14*(2), 49–60.

Blomberg, J., & Darrah, C. (2015). Towards an anthropology of services. *The Design Journal*, *18*(2), 171–192.

Cho, A., Herrera, R. G., Chaidez, L., & Uriostegui, A. (2019, May). The "Comadre" project: An asset-based design approach to connecting low-income latinx families to out-of-school learning opportunities. In *CHI '19: Proceedings of the 2019 CHI conference on human factors in computing systems* (pp. 1–14). Association for Computing Machinery.

Creswell, J. W., & Creswell, J. D. (2017). *Research design: Qualitative, quantitative, and mixed methods approaches*. Sage.

Edwards, P. N. (2003). Infrastructure and modernity: Force, time, and social organization in the history of sociotechnical systems. In T. J. Misa, P. Brey, & A. Feenberg, *Modernity and Technology* (pp. 185–226). MIT Press.

Gutiérrez Páez, C. E., Arguello Pirazán, E., & Rodríguez Murcia, R. A. (2017). *Análisis de inclusión social de población afro-descendiente en centros de práctica de medicina ancestral Kilombos en Bogotá* [Master's dissertation, Universidad de LaSalle]. https://ciencia.lasalle.edu.co/maest_gestion_desarrollo/118

Hamedani, N. G., Purvis, T. M., Glazer, S., & Dien, J. (2012). *Ways of manifesting collectivism: An analysis of Iranian and African cultures*. University of Maryland. https://mdsoar.org/handle/11603/7293

Hou, W. K., Liu, H., Liang, L., Ho, J., Kim, H., Seong, E., Bonnano, G. A., Hobfoll, S. E., & Hall, B. J. (2020). Everyday life experiences and mental health among conflict-affected forced migrants: A meta-analysis. *Journal of Affective Disorders*, *264*, 50–68.

Koskinen, I., Zimmerman, J., Binder, T., Redstrom, J., & Wensveen, S. (2011). *Design research through practice: From the lab, field, and showroom*. Elsevier.

Kirillova, K., Gilmetdinova, A., & Lehto, X. (2014). Interpretation of hospitality across religions. International Journal of Hospitality Management, *43*, 23–34.
Kyngäs, H. (2020). Inductive content analysis. In H. Kyngäs, Mikkonen, K., & M. Kääriäinen (Eds.), *The application of content analysis in nursing science research* (pp. 13–21). Springer.
Laba, R. (1991). *The roots of solidarity: A political sociology of Poland's working-class democratization*. Princeton University Press.
Manzini, E. (2007). Design research for sustainable social innovation. In R. Michel (Ed.), *Design research now* (pp. 233–245). Birkhäuser.
McNutt, J. (2008). Advocacy organizations and the organizational digital divide. *Currents: New Scholarship in the Human Services*, *7*(2), 1–16.
Mazzucato, V. (2008). The double engagement: Transnationalism and integration. Ghanaian migrants' lives between Ghana and the Netherlands. *Journal of Ethnic and Migration Studies*, *34*(2), 199–216.
Meroni, A., & Sangiorgi, D. (2011). A new discipline. In *Design for services* (pp. 9–33). Gower.
Nussbaum, B. (2003). African culture and Ubuntu. *Perspectives*, *17*(1), 1–12.
Pei, L., Wong-Villacres, M., Erete, S., Rosner, D., Taylor, A., & Wiberg, M. (2022). Who we are and what we have: Designing with minoritized communities. *Interactions*, *29*(5), 5. https://doi.org/10.1145/3557984
Phizacklea, A. (Ed.). (1983). *One way ticket: Migration and female labour*. Routledge.
Resnick, P. (2001). Beyond bowling together: Sociotechnical capital. In J. M. Carroll (Ed.), *HCI in the new millennium*, (pp. 247–272). Addison-Wesley.
Riza, E., Kalkman, S., Coritsidis, A., Koubardas, S., Vassiliu, S., Lazarou, D., Karnaki, P., Zota, D., Kantzanou, M., Psaltopoulou, T,.& Linos, A. (2020). Community-based healthcare for migrants and refugees: A scoping literature review of best practices. *Healthcare*, *8*(2), 115. https://doi.org/10.3390/healthcare8020115
Robison, L. J., Schmid, A. A., & Siles, M. E. (2002). Is social capital really capital? *Review of Social Economy*, *60*(1), 1–21. https://doi.org/10.1080/00346760110127074
Ryu, M., & Tuvilla, M. R. S. (2018). Resettled refugee youths' stories of migration, schooling, and future: Challenging dominant narratives about refugees. *The Urban Review*, *50*, 539–558. https://doi.org/10.1007/s11256-018-0455-z
Ropohl, G. (1999). Philosophy of socio-technical systems. *Techné: Research in Philosophy and Technology*, *4*(3), 186–194.
Sangiorgi, D., & Prendiville, D. (2014). A theoretical framework for studying service design practices: First steps to a mature field. In E. Bohemia, A. Rieple, J. Liedtka, & R. Cooper (Eds.), *19th DMI: Academic design management conference: Design management in an era of disruption, London, 2–4 September 2014* (pp. 2422–2440). Design Management Institute. https://tinyurl.com/mt8c6dpk
Sanders, E. B. N., & Stappers, P. J. (2014). Probes, toolkits and prototypes: Three approaches to making in codesigning. *CoDesign*, *10*(1), 5–14.
Standing, G. (2011). *The precariat: The new dangerous class*. Bloomsbury Academic.
Syed, I. U. (2016). Labor exploitation and health inequities among market migrants: A political economy perspective. *Journal of International Migration and Integration*, *17*(2), 449–465.
Syed, I. U. (2016). Labor exploitation and health inequities among market migrants: A political economy perspective. *Journal of International Migration and Integration*, *17*(2), 449–465.
Van Walsum, S. (2016). Regulating migrant domestic work in the Netherlands: Opportunities and pitfalls. In A. Triandafyllidou (Ed.), *Irregular migrant domestic workers in Europe: Who cares?* (pp. 161–186). Routledge.
Vink, J., & Oertzen, A. S. (2018, July). Integrating empathy and lived experience through co-creation in service design. In A. Meroni, A. M. Ospina Medina, & B. Villari (Eds.), Service design proof of concept: Proceedings of the ServDes. 2018 conference (pp. 471–483). Linköping University Electronic Press. https://ep.liu.se/ecp/150/ecp18150.pdf
Wong-Villacres, M., DiSalvo, C., Kumar, N., & DiSalvo, B. (2020). Culture in action: Unpacking capacities to inform assets-based design. In *CHI '20: Proceedings of the 2020 CHI conference on human factors in computing systems* (pp. 1–14). Association for Computing Machinery. https://doi.org/10.1145/3313831.3376329
Wong-Villacres, M., Gautam, A., Tatar, D., & DiSalvo, B. (2021). Reflections on assets-based design: A journey towards a collective of assets-based thinkers. *Proceedings of the ACM on Human-Computer Interaction*, 5(CSCW2), 1–32. https://dl.acm.org/doi/10.1145/3479545
Wong-Villacres, M., Gautam, A., Roldan, W., Pei, L., Dickinson, J., Ismail, A., DiSalvo, B. Kumar, N., Clegg, T., Erete, S., Roden, E., Sambasivan, N., & Yip, J. (2020, October). From needs to strengths: Operationalizing an assets-based design of technology. In CSCW '20: Conference companion publication of the 2020 on computer supported cooperative work and social computing (pp. 527–535). Association for Computing Machinery. https://dl.acm.org/doi/abs/10.1145/3406865.3418594