

Enabling self-determination through transformative service design and digital technologies: studying mobility experiences of people with disability

Sartori do Amaral, Carla^{*a}; Chamorro-Koc, Marianella^a; Beatson, Amanda^b; Tuzovic, Sven^b

^a School of Design, Queensland University of Technology, Brisbane, Australia

^b Business School, Queensland University of Technology, Brisbane, Australia

* carla.amaral@hdr.qut.edu.au

People with disabilities face many barriers for active participation in the workforce. One of the major obstacles that impact access to employment opportunities is mobility-related issues. Commuting to work and being able to navigate physical barriers is a crucial skill for people with physical disabilities to gain and maintain employment, as well as to exercise their self-determination. The evolution of digital technologies and the offerings of services online can facilitate journeys to work by enabling self-determination strategies to empower people in their everyday mobility dependent activities. However, difficulties often occur during self-directed interactions because of fragmented and disconnected information, causing service users to have little control over their journeys, which can negatively impact their wellbeing. This paper reports research that takes a transformative service design approach to identify areas where design can improve the interaction between people and digital technologies to enable self-determination of users in the context of planning and undertaking journeys to work. We present findings from eight critical incident-style interviews with people living with mobility-related impairments, highlighting barriers and enabling strategies that impact their self-determination in the context of journeys and how digital platforms assisted them in these situations. Five areas for design interventions are identified: planning and decision making, transport options, technology, policy and standards, and communication. These findings are indicative of key areas where service design can unlock the potential of digital technologies and play a transformative role in enabling self-determination for people with disabilities in their daily journeys to work.

Keywords: *digital technologies; mobility; disability; self-determination; transformative service design*

1 Introduction

One in five people lives with a disability in Australia. Those with a disability of working age (15-64 years) face barriers to employment, which result in significantly lower participation in the workforce compared to those without a disability (Australian Bureau of Statistics, 2016). Globally, the number of people with disabilities in working age is about 15% of the world's population, or 1 billion citizens (World Health Organization, 2011). Among the many obstacles people with a disability experience, mobility limitations and physical barriers are

crucial factors that can restrict participation in employment-related activities (Boyce, Malakar, Millman, & Bhattarai, 1999; Raja, 2016). For example, to gain and maintain employment, it is often necessary to be able to go from home to work daily. The ability to effectively navigate from one place to another is, therefore, an essential skill to support employment and self-determination of people with disabilities (LaGrow, Wiener, & LaDuke, 1990; Moore Sohlberg, Fickas, Lemoncello, & Hung, 2009; Shogren et al., 2009). Self-determination is the principle of self-direction and choice (Ryan & Deci, 2017), which directly impacts the feeling of wellbeing (Schalock & Verdugo, 2002; Wehmeyer, 2005).

Beyond participation in the workforce, navigating physical spaces can also represent barriers in social, economic, and community participation, especially for people with a physical disability (Raja, 2016). For this reason, when a person with disability experiences limitation to effectively navigate to work, their self-determination is impacted, and their sense of wellbeing is negatively affected. The problem is that, in Australia, current services and infrastructure do not enable effective commute to work for people with mobility-related impairments (Chamorro-Koc, Stafford, & Adkins, 2015) which limits self-determination and positions them in a situation of inequality.

Digital technologies can potentially enhance self-determination by making the journey to work more seamless (Adkins, Chamorro-Koc, & Stafford, 2015; Chamorro-Koc et al., 2015). Information and communication technologies (ICT) can help people with mobility-related disabilities to plan for their journeys, make sure they have access to the support they need to undertake the commute effectively, and also find strategies to manage issues that disrupt mobility during the trip (Chamorro-Koc et al., 2015). These evolutions in ICT allow people to be able to access services independently (Matthew L. Meuter, Ostrom, Bitner, & Roundtree, 2003), giving them more choice and control. The issue is that when there are disruptions to self-directed service interactions, self-determination can be limited and consequently generate a negative impact on users' wellbeing.

Design can play a transformative role in this complex system because it brings a human-centred approach to create transformational service experiences that improve wellbeing (S. Anderson, Nasr, & Rayburn, 2018). This transformative lens is vital in the context of this study because it recognises service users as experts of their experiences (Cottam & Leadbeater, 2004; Lundkvist & Yakhlef, 2004) and therefore, allows them to propose an agenda for change. In this paper, we investigate the experience of people with mobility-related impairments in Brisbane, Australia, about the use of digital technologies to prepare for and during journeys from a transformative service design perspective. Our focus is to identify opportunities from users' perspectives to propose areas for potential intervention where design can play a transformative role in enhancing self-determination in their journeys to work.

2 Digital technologies and self-determination

Technology can help people with physical disabilities overcome mobility problems, which are frequently the issues preventing their participation in the workforce (Boyce et al., 1999; Raja, 2016). However, while technology has brought many advancements and improvements to the lives of people with disabilities, they do not always enable their self-determination.

For example, in the context of online support services for people with disabilities, the National Disability Insurance Scheme (NDIS) is an initiative that the Australian government

is putting in place to have a significant online presence to help people achieve their desired goals and achieve social inclusion (National Disability Insurance Agency, 2018). The NDIS provides funding to support services such as mobility equipment and employment activities that people can access through an online portal (National Disability Insurance Agency, 2018). However, there is fragmentation in service delivery because how this amplification in access and connection with other governmental programs, such as disability employment services, is going to work is still being resolved (Stafford, Marston, Chamorro-Koc, Beatson, & Drennan, 2017). In addition, research has identified that people supported by the scheme and registered service providers reported issues with the online portal and difficulties in the access to care and resources (Mcloughlin, Mcnicoll, Beecher Kelk, Cornford, & Hutchinson, 2019). These problems limit users' self-determination because they cannot have full control and access to relevant information and support services.

There are digital platforms that are contributing to overcoming some of the informational gaps and lack of choice for participants of the NDIS programme. One example that enhances the self-determination of people with disabilities in the care sector is Clickability. This web-based platform enables service users to rate and review disability support services to assist their peers in making informed decisions about which services to contract (Clickability, 2019). The platform works in a peer-to-peer (P2P) format facilitating the connection between users and service providers. This kind of P2P flow is one of the approaches to empower users by challenging power inequalities and moral order (Mcloughlin et al., 2019). Figure 1 shows an example of an online search for transport services in the West End suburb of Brisbane, Australia, using Clickability's service directory. The results show the organisations that provide the service and include rating and reviews from other users that have previously contracted the service.

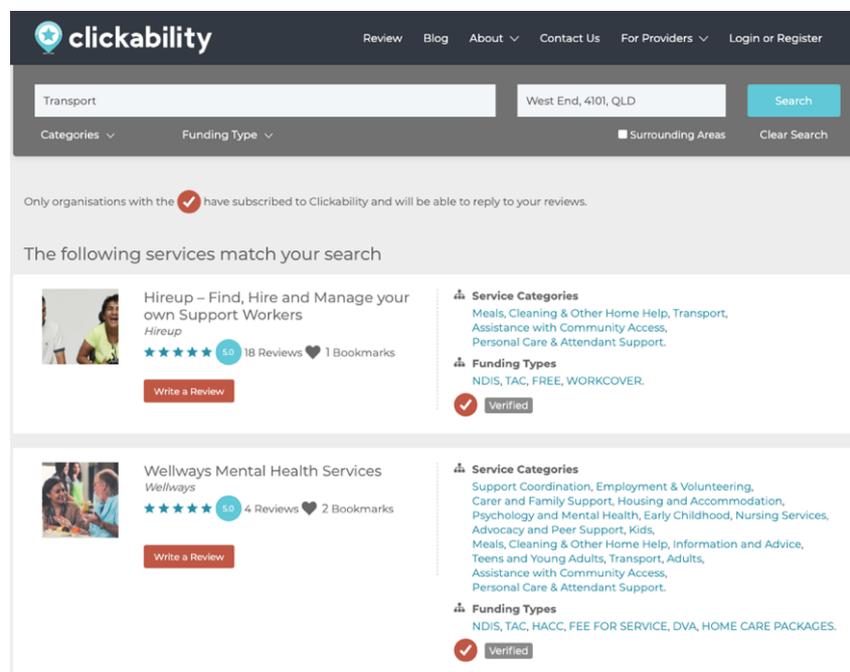


Figure 1. Example of Clickability's interface. Source: Clickability. (2019). Transport search. Retrieved from https://clickability.com.au/listing/?keyword=Transport&council=518&search_location=West+End%2C+4101%2C+QLD

In the mobility area, a Sydney based start-up is developing a mobile application called Navability to support navigation for wheelchair users. This app uses data crowdsourcing to create maps based on users' fitness, travel ability, and the physical accessibility of the route (Briometrix, 2017). This kind of personalised approach enhances people's confidence to undertake their journeys. Figure 2 shows an example of a map that Briometrix created for the city of Sydney 2017 New Year's Eve celebrations that offers information on accessible routes for wheelchair users based on the analysis of the gradients, pathways and users' travel effort (which is indicated by the colours on the map).



Figure 2. Accessible routes map for wheelchair users (left) and the travel effort colour legend (right). Source: Briometrix. (2017). Retrieved from https://www.briometrix.com/wp-content/uploads/2018/10/City_of_Sydney_New_Year_Eve_Accessibility_Effort_Mapping.pdf

These two examples indicate that user-generated content is critical to producing information that is relevant and helpful for those accessing online services. In the Clickability example, the P2P approach of user reviews gives a voice to the consumer of services to express their opinion and experiences, and in turn, the platform allows service providers to learn more about their customer needs. While in the Navability example, data to create the maps is generated by other wheelchair users, meaning that the route information provided is based on the mobility experience of people in similar situations, which makes the information more accurate.

This study incorporates the approach of these examples, which is to consider service users the experts of their experiences and therefore position them in the centre of the service system. In addition, we aim to extend the findings from previous work that highlighted the need for improvement in service delivery and the potential of using digital platforms to improve the mobility experience of people with disability (Adkins et al., 2015; Chamorro-Koc

et al., 2015) by contributing with insights to inform new services. Therefore, to investigate further ways in which design can unlock the potential of digital technologies in enabling self-determination for people with disabilities in their journeys to work, we applied a transformative service design approach which is unpacked in the next section of this paper.

3 Design as a transformative approach

The concept of transformation design, was introduced by Burns, Cottam, Vanstone, and Winhall (2006), and is associated with social change, and also with companies adopting a human-centred design culture into their practices. Sangiorgi (2011) analysed this concept tracing a connection between transformation design and service design suggesting that services are not the outcome but a tool for societal transformations thus also being able to help to build a more equitable society.

In the context of this research, we acknowledge that people's interaction with online services can have both a positive or negative impact on wellbeing (L. Anderson et al., 2013). One way of making sure online services improve the quality of life of users is by designing services that enhance self-determination and facilitate the connection between users and service providers (S. Anderson et al., 2018). This way, service providers are more familiar with users' needs and expectations and can respond accordingly.

Service design is a human-centred, integrative and transformative approach to the development of services (Sangiorgi et al., 2019). As human-centred, service design plays a role in understanding and mapping people's experiences (Meroni & Sangiorgi, 2011), as integrative it incorporates multidisciplinary knowledge to map complex systems, and as transformative, the design of services has the potential to enhance the collective feeling of wellbeing (Sangiorgi et al., 2019). For this reason, S. Anderson, et al. (2018, p. 110) propose that services can be "transformative by design" to enhance people's wellbeing.

Transformative service design (TSD) encompasses the human-centred vision of design with the service design approach of capturing users' perspectives and providing companies capabilities to better understand their customer needs (Iriarte, Alberdi, Urrutia, & Justel, 2017). We consider users the experts of their experiences as they play a key role in transformative service design by proposing an agenda for the improvement of their wellbeing (Cottam & Leadbeater, 2004; Lundkvist & Yakhlef, 2004). In this research, we employed critical incident-style interviews to help us have a deep understanding of people's mobility experiences to investigate current and potential service user needs. The findings generated from these interviews contribute with insights to inform transformative service design for digital technologies.

4 Method

In this research, we define journeys to work as the activities that people perform before and during a commute, including planning, familiarisation with the route, getting from one place to another, and any other activities included in this process. Following a transformative service design approach to understand users' experiences, we selected the Critical Incident Technique (CIT) as the method of data collection as it positions participants at the centre of inquiry and gives them agency to raise relevant events that impact their journeys.

4.1 Critical Incident Technique (CIT)

CIT is an inductive method of inquiry that supports the observation of human behaviour by triggering participants to recall stories that can be positive or negative experiences, which can then be categorised to address practical problems (Flanagan, 1954). Since its introduction to the social sciences, CIT has been applied to a variety of contexts and adopted by the service research field, including subject areas related to this study such as, service research (Bitner, Broome, & Tetreault, 1990), autonomous self-service encounters (Matthew L Meuter, Ostrom, Roundtree, & Bitner, 2000), and dis/satisfaction in the online service environment (Holloway & Beatty, 2008). This method suits this research because it “obtains a record of specific behaviors from those in the best position to make the necessary observations and evaluations” (Flanagan, 1954, p. 355), which is aligned with our vision that service users be the expert of their experiences.

CIT is a flexible and inductive technique (Flanagan, 1954), and it generates an in-depth record of events and a rich set of data (Gremier, 2004). However, it has received some criticism from the academic community. As the method relies on participants’ recollections of events that happened in the past, reports may be subjected to personal bias or lack of memory (Michel, 2001). Also, because of its flexibility, the method has been inconsistently applied, and therefore, researchers should use it thoughtfully and acknowledge its weaknesses (Marcella, Lockerbie, & Baxter, 2013).

We made conscious effort to follow Flanagan’s (1954) approach with minimal adaptations to be thoughtful and consistent in the application of CIT by having a clear aim and recording all details from participant’s reports of critical incidents which are further detailed in the following section. For this research, a critical incident is defined as: *limiting situations as well as supporting strategies perceived by participants to cause disturbances or to improve their self-determination in the use of digital platforms to prepare for or during journeys.*

4.2 Data Collection

We conducted semi-structured interviews with eight people with a physical disability living in Brisbane, Queensland, Australia. Brisbane is the third most populous city in Australia (Australian Bureau of Statistics, 2019). Transport options include travelling by road, rail, river, footpaths, bikepaths, and air (Department of Transport and Main Roads, 2019). Public transport is delivered by buses, ferries, and train (Brisbane City Council, 2019). This purposive sample of participants were people with various levels of mobility abilities and familiar with using digital technology to plan for or during daily journeys. All the participants but one were also employed at the time of the interview. We distributed a link to a screening questionnaire via social media post and email for people to self-identify whether they were interested in participating. We used the Gross Motor Classification System (GMFCS) (CanChild, 2019) as a guide to describing different levels of mobility and asked participants to self-report which level corresponded to their movement abilities. This information provided a helpful understanding of the diversity of mobility located under the broad category of physical disability. However, no preference was given to the GMFCS level as selection criteria. Another relevant selection criterion was the participant’s familiarity with the use of digital technology during commute because of the nature of the study. Table 1 shows participants’ profiles according to the answers they provided in the screening questionnaire.

Each interview lasted on average forty minutes and took place at an agreed location between the researcher and the participant. One interview was conducted via Skype because of the participant’s geographical location at the time of the study. Before the

interview, each participant received by email a copy of the study’s description, purpose, use of data and a copy of the consent form to become familiar with the research. When meeting in person, the researcher explained the study’s objectives again, clarified questions and obtained informed consent before beginning.

Following Flanagan’s (1954) advice, we had a clear aim for the interview, which was based on the critical incident definition. We asked participants to describe memorable examples of limiting situations or support strategies that impacted their self-determination during journeys and the role digital technology played during those incidents. In order to establish rapport, we started by asking participants to describe a typical journey that they usually undertake. The participants described their journeys in detail in sort of a timeline format, from the moment they prepare to leave, to the moment they arrive at their destination. They were also asked to describe how they adapted or dealt with unexpected events during journeys and if online services or digital platforms helped them to prepare for or during the journey. The interviews were conversational and participant-led with the researcher asking opportunistic questions when appropriate.

Because of the semi-structured, participant-led nature of the interviews, participants reported critical incidents not only about their journeys to work but also about other recollections of moments when they felt like their mobility was limited and self-determination was impacted, for example when going to restaurants and booking hotels. These reports have raised interesting perspectives not only about mobility but also about social participation in society. All the interviews were audio-recorded to include all the details of the incidents reported and to avoid data collection bias. The audios were later transcribed verbatim to prepare for data analysis.

Table 1. Participant’s profiles.

ID	Age	Gender	Commuting frequency	Transport type	Movement ability levels
P1	25-30	Male	2-3 times a week	Bus, train, own car	Level 4
P2	25-30	Male	Daily	Own car	Level 4
P3	25-30	Female	Rare occasions	Train, taxi	Level 4
P4	25-30	Female	Rare occasions	Taxi	Level 4
P5	25-30	Female	Rare occasions	Bus, train, taxi, own car	Level 4
P6	25-30	Female	2-3 times a week	Bus, train, taxi, own car	Level 2
P7	25-30	Male	Rare occasions	Bus, train, taxi, own car	Level 5
P8	25-30	Male	Daily	Own car	Level 3

4.3 Data Analysis

An inductive approach to data analysis was followed with the support of the ATLAS.ti software. Interview transcripts were uploaded to the software, and thematic analysis was conducted to categorise relevant incidents. In order to initially select critical incidents, we read the transcripts multiple times to become familiarised with the data.

To address the criticism that CIT has been inconsistently applied (Marcella et al., 2013), we generated a diagram with criteria for incident inclusion and exclusion containing key questions to guarantee a consistent selection of incidents. This step helped us to filter the transcripts and identify the critical incidents, which were later thematic analysed. The diagram (Figure 3) was created based on the research aims and definition of a critical incident. In order to determine if a critical incident was usable or not, we followed the

diagram starting at the top and moving down following the arrows according to the response for each question. The diagram also assisted us in dividing critical incidents into three groups, which are described in Table 2.

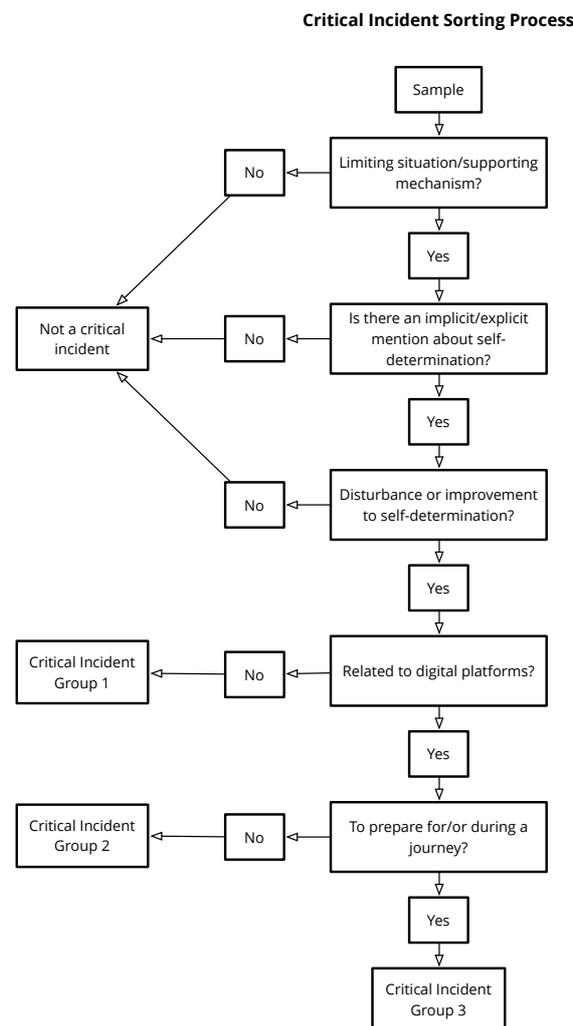


Figure 3. Critical incident sorting process diagram developed specifically for this research. Source: Authors.

In total, 54 usable incidents were identified using the sorting process. Table 2 describes each group, presents the number of critical incidents in each group, and provides examples of the content of the incidents within each group.

The groups demonstrate that participants' reports of critical incidents can be separated in three groups: group 1, when they only refer to impacts to their self-determination; group 2, when there is an interaction with a digital platform in addition to impact to their self-determination; and group 3 when they mentioned interaction with digital platforms during journeys that helped in situations where their self-determination was hindered, or when digital platforms improved self-determination. In the context of this study, digital platforms represent websites or applications that offer services or information that can be accessed by users through a computer, tablet or smartphone both online or offline, such as Facebook and Google.

Table 2. Critical incidents divided by group.

Group description	Number of Critical Incidents and %	Examples
Group 1 – Limiting situations as well as supporting mechanisms perceived by participants to cause disturbances or to improve their self-determination.	24 (44.4%)	Issues with train ramps not being brought out by guards. Good reports about accessibility overseas. Problems with the accessibility of footpaths, hotel rooms, restaurants, event venues. Ability to problem solve and frustration of having to ask for help. Difficulties with taxi drivers. Blocked footpaths and broken lifts.
Group 2 - Limiting situations as well as supporting mechanisms perceived by participants to cause disturbances or to improve their self-determination in the use of digital platforms.	11 (20.3%)	The importance of websites to have realistic photos of their venues. NDIS website provides vague information. Conflicting information about accessibility (online vs. reality). Problems with many different understandings of accessibility. Advantages of online peer support networks. Online reviews of services and venues (making informed decisions). Gaming and the feeling of equality. Issues around booking transport or accommodation for wheelchair users online.
Group 3 – Limiting situations as well as supporting mechanisms perceived by participants to cause disturbances or to improve their self-determination in the use of digital platforms to prepare for or during daily journeys.	19 (35.2%)	Advantages and disadvantages of ride-share services like Uber. Booking alert could help with train ramp issues. The necessity to call venues to double check or confirm online information about accessibility to plan for a journey. Online platforms assist in finding a plan B for journeys. More accurate and consistent online information on accessibility can help to plan for journeys. Virtual tours of journeys could facilitate the decision-making process before the journey. Communication with public transport provider is difficult. Vagueness or lack of update of online public transport information.

5 Initial Findings

A thematic analysis of the 54 critical incidents generated 5 categories and 24 sub-categories. Open coding was conducted initially using the research’s critical incident definition as the unit of analysis. Continuous re-examination was performed to refine the codes and group them into themes. Table 3 shows the classification system of all categories and sub-categories identified in the analysis process.

Table 3. Critical incidents divided by categories and sub-categories.

Category	%	Sub-categories	%
Planning and decision making (23)	29.1%	The need to contact the service provider to check information provided online (9)	11.4%
		Relying on others (5)	6.3%
		Planning for journeys (4)	5.1%
		Online support to problem-solve (2)	2.5%
		Skills and confidence (2)	2.5%
		Decision making (1)	1.3%
Transport options (21)	26.6%	Taxi (6)	7.6%
		Public transport accessibility (5)	6.3%
		Rideshare (4)	5.1%
		Public space accessibility (4)	5.1%

		Overseas experience (2)	2.5%
Technology (15)	19%	Suggestions for improvement (8)	10.1%
		Online peer support (3)	3.8%
		Online reviews (2)	2.5%
		NDIS (1)	1.3%
		Virtual environments (1)	1.3%
Policy and standards (12)	15.2%	Providing feedback to service providers (4)	5.1%
		Lack of understanding of user needs (3)	3.8%
		Accessibility information (2)	2.5%
		User as the expert (2)	2.5%
		Local council engagement (1)	1.3%
Communication (8)	10.1%	Photographs (4)	5.1%
		Inaccurate online accessibility information (3)	3.8%
		Outdated online information (1)	1.3%
Total: 79 codes			

Initial findings show that the largest category of limiting situations and support strategies impacting participants' self-determination in the use of digital platforms during journeys is planning and decision making (29.1%), followed by transport options (26.6%), technology (19%), policy and standards (15.2%), and communication (10.1%). Table 4 presents definitions of the 6 main categories, as well as sample quotes for both limiting situations that represent barriers for participants and supporting strategies that enable self-determination. Following the table, we discuss each of these categories.

Table 4. Categories definitions and examples from interview transcripts.

Category	Definition	Examples	
		Barriers	Enablers
Planning and decision making	Strategies employed to problem-solve in order to overcome barriers or unexpected events. Planning to avoid unnecessary risks.	I've become more conscious of asking people to stand up and let me have that seat because I obviously can't, I don't feel stable enough to stand on a moving train or bus and sitting sideways is painful and sitting backwards is also very painful. [...] It's so weird because I'm so independent and having to ask for help, it's not in my nature. (P6, relying on others)	Yeah, genuinely if a problem pops up I'll then rely on online services to help me problem solve that issue. [...] I think for the most part, like I'll potentially use Google Maps sometimes to not so much plan the trip but to see how long it'll take, just to ensure everything runs efficiently and timely and smoothly. (P7, online support to problem-solve)
Transport options	Positive and negative aspects of public transport, taxi and rideshare companies.	I would often get on the train and the guard who normally brings the ramp would often forget and I'd be left on the train. There was probably around, I'd say six times, that I was waiting for someone to get around and I tried to call them and they didn't	I'm lucky that I found a couple of regular drivers that I use quite a lot but the issue is that obviously because they're, because I like them, they are popular amongst all my mates as well, so they get used regularly, so I might only

		listen and the train just left. And I was stuck on the train. (P1, public transport accessibility)	get them for particular drives. (P7, taxi)
Technology	Digital platforms that provide accurate and relevant information as well as peer support networks that help people with disability.	But yeah there is no like travel page for disabled people to connect and like – no, don't go here, do this, do that. (P4, online peer support)	People doing reviews. People doing video blog reviews and stuff like that. [...] That's what I try to do. So, I find that's very helpful for people. (P5, online reviews)
Policy and standards	People have different understandings of accessibility success, and therefore the information provided or solutions offered do not correspond to the actual needs of users.	Some people have very different ideas of what's successful or not. So, it was last weekend, a friend who's also in a wheelchair, we were going up to Noosa for two nights and he booked a place and he was real happy with it. He said, Yep. Accessible. They got it. We booked it fine and then when he got there, um, their understanding of what accessible was, was completely different to what he needed. (P2, accessibility information)	Because I've had this unfortunate incident it has made me very wary of trying X, Y, Z and the same thing is for medication. A lot of doctors, they will say do this, but I'll often get a reaction. So, I'm allergic to codeine so a lot of pain relief has that in it. Yeah, it feels some days that the odds are so stacked up, but for me, being a bit of a risk assessor, for me it's really about continuing to minimising things that I don't need to have to come in contact with. Just to make my life easier. (P6, user as the expert)
Communication	Communication through digital platforms and differences between what is available online vs. reality.	It can get annoying sometimes because in my head versus what they say can be totally different [...] it's not updated. Like I'll know this where I am going, but the app is there saying take four busses, and I am there I only need to take one or two I mean, that's ridiculous. (P6, outdated online information)	I check Tripadvisor because they normally have realistic pictures of rooms and stuff. Where you get your hotel, the pictures of the rooms on the hotel website, they use wide angle lenses, which distorts everything and makes it look wider than it actually is. So, I always use Tripadvisor to see real pictures. (P1, pictures)

5.1 Planning and decision making (29.1%)

Learning how to find strategies to overcome barriers during journeys makes a big difference in people's decisions about whether or not they believe they can commute to a particular location. Participants explained that this decision-making process is directly related to their travel skills and confidence. However, it can also be influenced by the accessibility information they can find online. If they can independently find a way to plan for the journey or solve problems during a journey they can act with self-determination, on the other hand, it can be frustrating if they do not succeed.

Participants also mentioned that if they cannot independently solve a problem, asking for help to other people is used as a problem-solving strategy. In most of the cases relying on others to overcome barriers during journeys has been reported as a limiting situation that they experience. However, to avoid this situation and to prevent unnecessary risks or tricky situations, participants talked about the importance of planning journeys in advance.

Planning was the most relevant sub-category within problem-solving strategies. According to participants, it is quite hard to do things spontaneously because planning requires time and it usually starts hours, if not days before the actual commute takes place. It was mentioned that part of the planning process is the necessity to contact service providers to double-check information provided online. Contacting service providers was presented both as a supporting strategy because it gives people more confidence about the information provided online, but also a limiting situation because sometimes what is said online is not accurate or is outdated.

5.2 Transport options (26.6%)

The physical accessibility of buses and trains were described as an issue. Participants described critical incidents in public transport where, for example, they would not be able to get on or off the train because the ramp for the wheelchair would not be brought out for them. Some participants described that train stations in other countries they have visited were accessible, and they did not have to rely on guards or other people to bring a ramp for them. These overseas experiences were mentioned as a positive impact on their self-determination because they felt confident to go everywhere because they would know that every transport facility would be accessible.

Most of the reported incidents of experiences with taxi services were negative. Participants explained that they do not feel they have much control of where they are going during journeys. Another example was that some drivers charge more than what they are supposed to charge because they start the meter before loading the wheelchair into the car. It is rare to find a driver that they can trust, and when they do, they might only get them for particular drives because other people might request the same driver.

The experiences with rideshare companies were reported as both positive and negative. Some participants endorsed companies like Uber for their reliability in having drivers that can assist wheelchair users, while others said that this service does not work for them because they have different needs and the cars are not suitable. Security concerns were also raised in terms of the lack of security measures compared to taxi companies.

5.3 Technology (19%)

Social media provides the opportunity for people with mobility-related disability and other people in similar situations to have a voice, connect and build networks of peer support. Participants expressed that these networks are enabling strategies that help them in many situations, such as travel tips, updates on public transport (e.g. if a train track is out), and support services recommendations. The importance of these networks is the opportunity they give for people to make informed decisions about what services to use or what routes to take to make their journeys more seamless.

Participants also provided many insights on potential ways in which digital technologies could support them on their journeys. Some of the comments were around the possibility of restaurants, bars, hotels and other venues to have standard guidelines to follow in order to provide more specific, accurate and consistent information about the accessibility of their

spaces on their websites. Another comment related to public transport was to have some app to alert train guards on platforms to bring the ramp out for people that use wheelchairs.

Virtual environments were reported as spaces where participants feel empowered and equal. An example is when a participant reported being able to perform really well on an online game and to feel like the other participants were unaware of their physical differences.

5.4 Policy and standards (15.2%)

Finding within this category demonstrated that people have different understandings about accessibility success. Participants explained that in many occasions, they have read or received information about accessibility that did not correspond to their specific needs, resulting in the venue actually not being accessible to them. Because people with mobility-related disabilities are the ones having to adapt to different physical barriers during journeys, they have an expert perspective on what is best for them. Some participants expressed that sometimes having access to ramps and lifts is not sufficient to supply their needs, and there is a need for venues to consider accessibility facilities that go further than providing ramps and lifts. For this reason, some participants engage in providing feedback to service providers with suggestions on how to improve the physical space or the information that they give online. However, sometimes the response is positive, but on other occasions, it is not even possible to establish contact with service providers.

In this category, participants also commented about the lack of action from local councils after engaging with the disability community. Others talked about the NDIS online platform and its problems with vague information. There were also comments about mobility issues related to public space accessibility, such as steep ramps, limited accessible parking and pathways blocked for construction.

5.5 Communication (10.1%)

Participants mentioned that on many occasions, the information provided online about transport facilities and accessibility does not correspond with reality.

For example, in some situations, the information about public transport is outdated, and that can influence whether or not a participant decides to undertake a journey. This inaccuracy also happened with accessibility information, especially in hotel websites, where they say they can provide accessible rooms, and when the guest arrives, they see the room cannot accommodate them. One common mistake that hotels, restaurants and other venues make is to provide photographs of their space that were taken with wide-angle cameras, which distorts some of the dimensions of door widths, for example. Participants said that they usually try to access digital platforms that provide realistic photos of spaces, such as Tripadvisor, to make their assessment of whether or not space is accessible to them.

6 Design implications

These preliminary results provide insights into five key areas that can be explored for the design of new services from the end-user perspective. However, further investigation is also required to understand the challenges of service providers involved in the service delivery system. This initial investigation is the first stage of broader research, which envisages the application of findings in the development of digital platforms that would enable people with disabilities the ability to plan and problem solve their daily or routine journeys beforehand. Based on the initial findings, we suggest that a transformative service design approach to the design of such service or enhanced P2P digital platform should address the following:

- A Digital Strategy Toolbox (of planning and decision-making strategies): this will comprise delivery strategies that combine existing support services with successful problem-solving practices of people with lived experience of disability.
- An online collaborative platform for up to date users' rating of transport options.
- A co-produced tool or communication channel that allows end-users and service providers to communicate and share accessibility problems and solutions. This tool will help increase stakeholders understanding of accessibility by improving communication channels between service users and service providers for users to be able to communicate their needs.
- A Reality Map or Viewer, based on end-users' input, and that display consistent and relevant information about accessibility online.

7 Conclusion

This paper has reported research that undertakes a transformative service design approach and a critical incident method to identify areas where design can improve the interaction between people and digital technologies to enable self-determination in everyday journeys. The critical incident interviews have allowed the identification of issues that people with mobility-related impairments face in their journeys to work and in other aspects of their lives and how they manage to overcome these barriers. Participants mentioned barriers and enabling strategies and, in some cases, pinpointed how technology assisted them during these critical moments. This study is the first phase of broader research and therefore the ideas and design implications presented will continue to evolve as the study progresses. Future research steps will involve engagement with service providers and focus on applying the findings in the development of guidelines supporting the design of digital platforms that enable self-determination for people with mobility-related disabilities.

8 References

- Adkins, B., Chamorro-Koc, M., & Stafford, L. (2015). New Mobilities for Accessible Cities: Toward Scenarios for Seamless Journeys. In D. Araya (Ed.), *Smart Cities as Democratic Ecologies* (pp. 200-218). New York, NY: Palgrave Macmillan.
- Anderson, L., Ostrom, A. L., Corus, C., Fisk, R. P., Gallan, A. S., Giraldo, M., . . . Williams, J. D. (2013). Transformative service research: An agenda for the future. *Journal of Business Research*, 66(8), 1203-1210. doi:10.1016/j.jbusres.2012.08.013
- Anderson, S., Nasr, L., & Rayburn, S. W. (2018). Transformative service research and service design: synergistic effects in healthcare. *The Service Industries Journal*, 38(1-2), 99-113. doi:10.1080/02642069.2017.1404579
- Australian Bureau of Statistics. (2016). Disability, Ageing and Carers, Australia: Summary of Findings, 2015. Retrieved from <http://www.abs.gov.au/ausstats/abs@.nsf/0/C258C88A7AA5A87ECA2568A9001393E8?OpenDocument>
- Australian Bureau of Statistics. (2019). 3218.0 - Regional Population Growth, Australia, 2017-18. Retrieved from <https://www.abs.gov.au/AUSSTATS/abs@.nsf/Lookup/3218.0Main+Features12017-18?OpenDocument>
- Bitner, M. J., Brooms, B. H., & Tetreault, M. S. (1990). The Service Encounter: Diagnosing Favorable and Unfavorable Incidents. *Journal of Marketing*, 54(1), 71-84.
- Boyce, W., Malakar, S., Millman, R., & Bhattarai, K. (1999). Physically disabled children in Nepal: a follow up study. *Asia Pacific Disability Rehabilitation Journal*, 10(1).
- Briometrix. (2017). Navability accessible navigation. Retrieved from <https://www.briometrix.com/navability/>

- Brisbane City Council. (2019). Public transport. Retrieved from <https://www.brisbane.qld.gov.au/traffic-and-transport/public-transport>
- Burns, C., Cottam, H., Vanstone, C., & Whinhall, J. (2006). *Transformation Design*. London: Design Council.
- CanChild. (2019). GMFCS. Retrieved from <https://www.canchild.ca/en/resources/42-gross-motor-function-classification-system-expanded-revised-gmfcs-e-r>
- Chamorro-Koc, M., Stafford, L., & Adkins, B. (2015). *Seamless journeys enhancing accessibility to work through digital technologies for people with mobility-related impairments*. Paper presented at the IASDR2015 Interplay, Brisbane, Australia.
- Clickability. (2019). What is Clickability? Retrieved from <https://clickability.com.au/about/>
- Cottam, H., & Leadbeater, C. (2004). *Red paper 1 health: co-creating services*. Retrieved from London: <https://www.designcouncil.org.uk/sites/default/files/asset/document/red-paper-health.pdf>
- Department of Transport and Main Roads. (2019). Travel and Transport. Retrieved from <https://www.tmr.qld.gov.au/Travel-and-transport>
- Flanagan, J. C. (1954). The Critical Incident Technique. *Psychological Bulletin*, 51(4), 327-358.
- Gremler, D. D. (2004). The Critical Incident Technique in Service Research. *Journal of Service Research*, 7(1), 65-89. doi:10.1177/1094670504266138
- Holloway, B. B., & Beatty, S. E. (2008). Satisfiers and Dissatisfiers in the Online Environment. *Journal of Service Research*, 10(4), 347-364. doi:10.1177/1094670508314266
- Iriarte, I., Alberdi, A., Urrutia, E., & Justel, D. (2017). Beyond customer satisfaction. Supporting organisational change through Service Design. A case study in the insurance industry. *The Design Journal*, 20(1), S424-S434. doi:10.1080/14606925.2017.1352950
- LaGrow, S., Wiener, W., & LaDuke, R. (1990). Independent travel for developmentally disabled persons: A comprehensive model of instruction. *Research in Developmental Disabilities*, 11(3), 289-301. doi:10.1016/0891-4222(90)90014-Y
- Lundkvist, A., & Yakhlef, A. (2004). Customer involvement in new service development: a conversational approach. *Managing Service Quality: An International Journal*, 14(2/3), 249-257. doi:10.1108/09604520410528662
- Marcella, R., Lockerbie, H., & Baxter, G. (2013). *Critical incident technique as a tool for gathering data as part of a qualitative study of information seeking behaviour*. Paper presented at the Qualitative Market Research: An International Journal.
- Mcloughlin, I., Mcnicoll, Y., Beecher Kelk, A., Cornford, J., & Hutchinson, K. (2019). A 'Tripadvisor' for disability? Social enterprise and 'digital disruption' in Australia. *Information, Communication & Society*, 22(4), 521-537. doi:10.1080/1369118X.2018.1538382
- Meroni, A., & Sangiorgi, D. (2011). *Design for Services*: Gower.
- Meuter, M. L., Ostrom, A. L., Bitner, M. J., & Roundtree, R. (2003). The influence of technology anxiety on consumer use and experiences with self-service technologies. *Journal of Business Research*, 56(11), 899-906. doi:10.1016/S0148-2963(01)00276-4
- Meuter, M. L., Ostrom, A. L., Roundtree, R., & Bitner, M. J. (2000). Self-service technologies: Understanding customer satisfaction with technology-based service encounters. *Journal of Marketing*, 64(3), 50-64. doi:10.1509/jmkg.64.3.50.18024
- Michel, S. (2001). Analyzing service failures and recoveries: a process approach. *International Journal of Service Industry Management*, 12(1), 20-33. doi:10.1108/09564230110382754
- Moore Sohlberg, M., Fickas, S., Lemoncello, R., & Hung, P.-F. (2009). Validation of the Activities of Community Transportation model for individuals with cognitive impairments. *Disability and Rehabilitation*, 31(11), 887-897. doi:10.1080/09638280802356260
- National Disability Insurance Agency. (2018). About us NDIS. Retrieved from <https://www.ndis.gov.au/about-us>
- Raja, D. S. (2016). *Bridging the disability divide through digital technologies*. Retrieved from <http://pubdocs.worldbank.org/en/123481461249337484/WDR16-BP-Bridging-the-Disability-Divide-through-Digital-Technology-RAJA.pdf>
- Ryan, R. M., & Deci, E. L. (2017). *Self-Determination Theory : Basic Psychological Needs in Motivation, Development, and Wellness*. New York: The Guilford Press.
- Sangiorgi, D. (2011). Transformative Services and Transformation Design. *International Journal of Design*, 5(2), 29-40.
- Sangiorgi, D., Lima, F., Patrício, L., Joly, M. P., Favini, C., Sangiorgi, D., . . . Favini, C. (2019). A Human-Centred, Multidisciplinary, and Transformative Approach to Service Science: A Service Design Perspective. In *Handbook of Service Science, Volume II* (pp. 147-181): Cham : Springer International Publishing : Imprint: Springer.

- Schalock, R. L., & Verdugo, M. A. (2002). *Handbook on quality of life for human service practitioners*. Washington, DC: American Association on Mental Retardation.
- Shogren, K., Bradley, V. J., Gomez, S. C., Yeager, M. H., Schalock, R. L., Borthwick-Duffy, S., . . . Wehmeyer, M. L. (2009). Public policy and the enhancement of desired outcomes for persons with intellectual disability. *Intellectual and Developmental Disabilities, 47*(4), 307-319. doi:10.1352/1934-9556-47.4.307
- Stafford, L., Marston, G., Chamorro-Koc, M., Beatson, A., & Drennan, J. (2017). Why one size fits all approach to transition in Disability Employment Services hinders employability of young people with physical and neurological disabilities in Australia. *Journal of Industrial Relations, 59*(5), 631-651. doi:10.1177/0022185617723379
- Wehmeyer, M. L. (2005). Self-Determination and Individuals with Severe Disabilities: Re-Examining Meanings and Misinterpretations. *Research and Practice for Persons with Severe Disabilities, 30*(3), 113-120. doi:10.2511/rpsd.30.3.113
- World Health Organization. (2011). *World report on disability*. Retrieved from Malta: https://apps.who.int/iris/bitstream/handle/10665/70670/WHO_NMH_VIP_11.01_eng.pdf;jsessionid=0E86EE58CFBDE72F8D76CDBE78DF0E91?sequence=1

About the Authors:

Carla Sartori do Amaral: is a PhD candidate interested in the area of transformative service design. Her current research focuses on improving the mobility experience of young people with physical disabilities by developing a peer-to-peer framework for digital platforms.

Dr Marianella Chamorro-Koc: current research in on People Sustained Engagement with Technologies in two distinctive areas: Design for Health Innovation, and Viable Futures through Design. Marianella leads the QUT Design Lab Program of Design for Health and Wellbeing.

Dr Amanda Beatson: research focus is on optimising customer value; particularly how to create and maintain positive service experiences and organisational image. She publishes broadly including, *Journal of Business Ethics*, *Journal of Marketing Management* and *The Service Industries Journal*.

Dr Sven Tuzovic: is Senior Lecturer of Marketing at QUT Business School. Prior to QUT, he was Associate Professor at Pacific Lutheran University, USA. His research focuses on services marketing, customer experience management, and the adoption of service technologies.

Acknowledgement: The research team would like to thank all participants for their support and for sharing their stories and experiences. Their contribution was central to the insights presented in this paper.