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Enactive methods towards situational learning - engaging people with intellectual and developmental disability in design

Lise Amy Hansen[a]*, Sofie Wass[b]

[a]*The Oslo School of Architecture and Design, Oslo, Norway*
[b]*University of Agder, Grimstad and Kristiansand, Kristiansand, Norway*

Abstract

In this paper we explore how enactive methods may support and enhance the design of mobile solutions for people with intellectual and developmental disabilities. Our project deals with supporting independent public transport and applies enactive methods in order to account for the interdependent nature of technology, disability, and environment. We staged three iterations of a bus workshop and one theatre workshop where real, everyday scenarios were acted out to gain tacit yet crucial insights. These enactive workshops and the prototype testing showed that transport activities are context dependent and unique to each individual. In our case, enactive methods revealed that independent public transport goes beyond a need for reminders, time management and communication, towards the management of unforeseen events. Our work shows how a closer realistic setting may provide more nuanced, personal, and detailed design insights that support emotional and situational understandings of user experiences.

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* Corresponding author. *E-mail address:* liseamy.hansen@aho.no

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1. Introduction

Social inclusion of marginalized groups such as people with intellectual and developmental disabilities (IDD) is an acknowledged goal for many societies [1]. This includes, among other areas, work inclusion. Being able to partake in the workforce contributes towards increased health and well-being as it is vital for establishing social networks and provides daily routines [2,3]. One important aspect of social inclusion is being able to independently travel to and from work, yet several barriers to independent travel remain for people with IDD [4]. Digital solutions supporting independent travel may thus serve as an entry point to society. While research has shown that digital services have the potential to support barriers such as tackling the physical environment, managing complexity, and interactions with other travelers [5-7] the involvement of people with IDD in participatory design processes is limited [8].

An understanding of disability, and thereby also the engagement of people with disability in design processes, relies on different models of disability. Models have focused on improving the ability or 'removing' the disability of the individual, placing the responsibility for change on the person with IDD [9]. Other models see the required change as a structural and societal challenge [10]. The Scandinavian or GAP model combines these two approaches by addressing the potential mismatch of a person's abilities and societal demands [11], and proposes that a solution space may be identified with the individual, with society, or with both [12]. Following this view, we report on the process of designing a transport supporting prototype together with people with IDD. We aim to answer the following research question: How may enactive methods support and enhance an understanding of design solutions for users with IDD? Our specific case focuses on independent, public transport and scenario enactments on a rented local bus complete with a regular bus driver as well as scenario enactments during a drama class.

In the following section we describe our frame of reference - enactive methods, followed by the methods carried out in our study and a description of our prototype design. In the discussion we elaborate on how enactive methods may lead to more nuanced insights and influence the framing of the solution space. Finally, we conclude our study.

1.1. Background

The developmental psychologist Stern points to how we naturally experience people in terms of their vitality - expressed in our almost constant movements - as a key to the communication of experience [13]. Positioning experience in this way (as opposed to relating it to function or to language) allows a consideration of the sophisticated ways we have of reading each other in order to communicate and to relate to each other, the context and the technology. Enative methods acknowledge cognition as bodily experiences accrued by adaptive actions to one's surrounding environments, and persons with IDD may show alternative skills (and challenges) in handling everyday social situations [14]. It is claimed that a fundamentally relational and dynamic process of individual agency is crucial for an understanding of a particular experience, avoiding the view of challenges as inherent, fixed properties of individuals [15]. As such, our enactive approach aligns with the Scandinavian model of disability [12].

For design it has been found that empathy is determined by the designers' own motivation, emotional state and commitment [16] and there is still a lack of understanding as to how to make use of prior research on user involvement, and applying it in practice [17]. By creating scenarios that are enacted, researchers and participants have a possibility to engage in experiential learning defined as 'the process whereby knowledge is created through transformation of experience' [18]. Learning is a social process, and situated learning enables us to understand and acquire knowledge in real-life contexts [19,20]. However, accounting for experience in this manner also has its limitations, in the sense that we have a particular insight into other people's bodies through the projection of our own [21]. The researchers participating in the situated learning scenarios together with our participants, will not have the same experience, yet one may still be able to gain vital insights towards developing our innovations. As such, our study contributes to discussions in HCI on how to draw on active, embodied, and embedded aspects of cognition [e.g. 22] as with our user group, their experience is not necessarily mirrored in the participating researchers'.

2. Methods

This study follows the principles of action design research in which practice-inspired problems are solved through the design of digital services [23]. The data collection started in 2018, with seven participant observations, seven focus

group interviews, and six individual interviews to understand the problem space of transitioning from school into work for people with IDD. During this first phase, we identified independent transport as a vital but complex element in gaining and keeping employment. Transport was further explored in an ideation workshop and through nine photovoice interviews, highlighting the potential of a mobile application to support people with IDD during transport. Based on these insights we design an initial prototype (described in section 3) with a focus on identifying the correct bus, receiving reminders, time management, and communication. The findings related to the initial observations and interviews are reported in [24] and insights from photovoice interviews in [25]. In this paper, we describe the enacted elements of the further data collection: a bus workshop and a theatre workshop (See Figure 1).

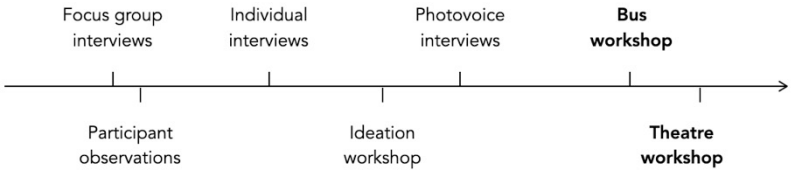

Fig. 1. Overview of our research process and the scope of this paper (in bold).

2.1. Bus workshop

The bus workshop was staged as an everyday public transport setting and consisted of scenarios based on the previously identified elements: identifying the correct bus, receiving reminders (before, during and after), time management and communication with parents and employers. To carry out the workshop, we rented a local bus complete with a regular bus driver. Prior to the workshop, the researchers had a walk-through of the planned route and scenarios, and instructed the bus driver. Three researchers also met with the potential participants and a proxy (teachers and a manager) to present themselves and the research project, answer questions, and propose the scenarios. The meeting enabled us to familiarize ourselves with the participants and their range of abilities thus ensuring the relevance of the scenarios. The scenarios were run three times with twelve participants in total. The first group consisted of five participants from an adjusted work placement, and the two other groups of three and respectively four students from a secondary school. The participants included six women and six men, out of these ten participants were adolescents and two participants were adults. All participants were able to express themselves verbally, had previous experience of taking the bus but only three did so independently. Eight researchers participated in the bus workshops, four as facilitators and four as observers (see Fig. 2)

Fig. 2. The rented, local, public bus and set up.

A field note template was created to record notes during the workshop. Directly after the workshop, the observing researchers summarized their notes individually. Each pair of facilitator and observer then discussed these notes to cover any missing aspects. Finally, all notes were gathered and analyzed by two of the involved researchers, based on thematic analysis [26]. This analysis focused on feedback on the prototype, additional user needs, and environmental aspects of public transport.

2.2. Theatre workshop

The theatre workshop was carried out as a drama class at a secondary school. Prior to the workshop the researchers had discussed the scenarios and the possible use of props with two of the teachers on an online-meeting in order to adjust activities to the skills and abilities of the participants. The theatre workshop included ten young participants, where all but one attended the same student group. Two were women and eight were men. All participants could express themselves verbally, had experience of taking a bus but only two did so independently. Four researchers participated in the workshop, two as facilitators and two as observers.

Fig. 3. The drama room set-up.

As a first activity, everyone in the classroom took part in a typical drama warm-up with singing and movement. The workshop consisted of the same scenarios as in the bus workshop. The activities focused on taking the bus from school to a concert hall where the participants were to perform. Chairs were arranged to simulate a bus and each participant carried an instrument for the concert (see Fig. 3). The scenarios were enacted in two steps - first without the prototype, and then with the prototype where it was shown on a screen and its use was facilitated by a researcher. The other three researchers enacted all the scenarios together with the participants.

One researcher took visual notes and another took field notes. During each scenario the group were asked to reflect on their experience together as a group. Directly after the workshop, the researchers discussed and summarized their notes. The main data collected from this workshop consisted of observations connected to feedback on the prototype and additional user needs. However, as the set-up was dramatized in a classroom and the participants traveled as a group, there was less contextual behavior to observe compared to the bus workshop. The workshop did contribute by validating the findings from the bus workshop.

2.3. Ethical considerations

The invited participants were informed about the aim of the research project and the planned activities. They were told in writing and in person that participation was voluntary and that they could withdraw from the activities at any time without consequences. For the participants under 18 years old, we also obtained consent from the parents. All participants could invite a proxy to join them if they wished so. The research project was approved by the National Centre for Research Data, Norway (648227).

3. Prototype Design

In this section we present the prototype that was tested in the bus workshop and the theatre workshop as well as the redesign of the prototype. The prototype was designed in Adobe Xd and intended to be used on smartphones.

3.1. First prototype iteration

One of the identified challenges from the initial observations and interviews centered on reminders. Our participants described it as challenging to identify the correct bus as navigating the current public system relies on literacy and vision skills. For instance, one participant with IDD spent his attention and energy on organizing himself prior to the journey, to the extent that it affected his work performance. This is in line with previous studies which

report that the task of moving around in a complex environment can in itself be exhausting [5]. The same concern was identified for leaving the bus at the intended stop. In addition, there were activities to be carried out during the journey that required reminders such as putting on a seatbelt, putting on your coat, and notifying the driver where to stop. The first prototype was designed to include these reminders to support independent transport. In the prototype we had real-life photos of people carrying out these activities, such as putting on a seat belt. Reminders were supported by instructions in text and with a text-to-speech button (see Fig. 4A-C).

Early user insights showed that time is an abstract concept that can be challenging for people with IDD, in particular in relation to the shifting location of a bus. This can cause practical problems - from missing the bus to missing your stop. The lack of time management can also create further stressful experiences [27]. In the first version of the prototype, time was visualized in two different versions, as a pie chart and as a row of small colored busses - both in combination with text and with a text-to-speech button (see Fig. 4D-E). This design choice was based on time visualization tools that are often used in daily life for people with IDD, such as the MEMO Timer [28]. The MEMO Timer uses LED dots that go out as time passes, sometimes in combination with sound or vibration as time is up.

To travel independently, it is vital to know what to do when you miss a bus or get off at the wrong stop. Participants in the early stage of the project shared examples of how they, or other people with IDD, would take one bus earlier than needed in order to avoid having to deal with a potential delay - choosing instead to arrive much too early for work. Examples were also identified of people with IDD that had used Facetime as assistance when getting lost. The prototype therefore included a function for communicating with a set of predefined actors. Due to our focus on employment, the options were to contact a manager or a parent. The first prototype included a shortcut to a phone call and also the opportunity to share your current location (see Fig. 4F-G).

Figure 4A-G: 4A-C show examples of reminders in the prototype, 4D-E show visualizations of time management, 4F-G show communication options in the prototype.

3.2. Second prototype iteration

The bus and the theatre workshops showed that elements that support transport activities are unique to each individual with IDD and also context dependent. Customization was one of the most addressed needs in relation to usability, disability, and environment. The vital aspects for altering the prototype according to one's own needs, were a) visualization, timing, and content of reminders, b) digital or linear time visualization, c) text, voice-call, or prewritten text messages as mode of communication, and d) 'silent' communication or text-to-speech options. For instance, some preferred visualization of reminders as photos while some preferred graphic representations. For others it was crucial that the photo showed themselves in the actual situation (for instance themselves putting on a seat belt on a bus). The bus workshop showed that timing of reminders could confuse as much as support, such as when being reminded to prepare to get off the bus, but not knowing or comprehending exactly how much time remained until the bus stop.

Both the bus and the theatre workshops revealed that the visualization of time in the prototype did not fully support the participants. As a result of these findings, we arranged further workshops with a school (engaging two teachers) and a supported employment agency (engaging two managers). In these workshops we tested four different sets of

time visualizations. The visualizations were linear and circular, static and dynamic, abstract and figurative, traditional and playful. The workshops showed that visualizations of time need to be simple yet not child-like in its illustrations, in order to avoid causing stigma. According to the participants, most of their students and employees used digital clocks and were familiar with a linear red line indicating time (as on Youtube videos).

Regarding mode of communication, we found that it was important to support voice calls and for some, prewritten text messages due to literacy skills. The scenario of getting off at the wrong bus stop, showed that some participants would like to use video calls to parents, teachers, or employers to ask for assistance to locate themselves.

One participant described that if he would be forced to ask people in the vicinity for assistance, he would experience the stressful feeling of having a heart attack. Others, again, were untroubled by this scenario and preferred to ask other travellers for help. The bus workshop showed that it was important for some to be able to remove the text-to-speech function as this was stigmatizing. While standing at a bus stop, for instance, it would reveal to their environment that they had a special need. For others again, the text-to-speech function was vital along with prewritten text messages.

All workshops revealed that a central aspect of transport support is the pedagogy of facilitating a personal development and learning. We found that the participants who already did travel independently, did so after extensive training and repetition and had learned how to anticipate and manage the transport situation. The second version of the prototype therefore supports training towards taking the bus and customization of the reported functions (see Fig. 5). As an overall evaluation, we noted that the majority of the transport aspects above, are unique to each individual and context dependent. While customizations of the application can support individuality and situational aspects, we were able to understand and reframe the solution space to mainly address how to manage unforeseen events.

Fig.5. Example of screens from the second version of the prototype, including customization, a prewritten text message and training modes towards taking the bus.

4. Discussion

In this section, we discuss how enactive methods may lead to nuanced user insights and influence new framings of the solution space. Exploring the prototype by way of acting out the scenarios uncovered tacit knowledge and created a common understanding of the design solution space [30]. We found that the closer to a realistic setting we were, the more nuanced, personal, and detailed the insights were. The enactive explorations demonstrated crucial differences among the participants such as that a function that was vital for one person to travel independently, could complicate and hinder travel for another. For instance, the text-to-speech function was experienced as stigmatizing by some participants while it helped others. In addition, a closer realistic setting gave us more emotional and situational understandings [18] of the solution space. In the most realistic setting, the bus workshop, we experienced situations where the young people acted, reacted, and showed emotions relating to not only the prototype but also to the surrounding environment. For instance, how the prototype was experienced in a situation with classmates nearby or interaction with an unknown passenger. However, in the less realistic theatre workshop setting, we were unable to increase our learning about emotional and situational elements needed to support independent travel. Still, the theatre workshop contributed to confirm our findings related to usability insights from the bus workshop.

Our study confirms that it is vital to get involved in the surroundings of the research participants [29] and that time needs to be spent to establish a relationship with the participants and their network [30]. During the bus workshop,

each participant acted out the scenarios individually, accompanied by two researchers, while during the theatre workshop the scenarios were acted out with the participants as a group. The group set-up turned out to make it difficult to initiate discussions on emotions and potential situations during the scenarios. This confirmed that variation of individual needs and preferences of participants is vital to facilitate for, as our grouped theatre enactment had a limited remit. This corresponds with the Scandinavian or GAP model of disability, which stresses the importance to understand disability in the specific situational context in which it becomes a challenge [9] i.e. disability emerges in the interaction between the individual and the environment [31]. The bus workshop where each participant was closely followed, allowed us to observe examples of such situations and interactions. When we travelled together on the bus with the participants, their experience could be transformed to a greater extent compared to the theatre workshop. If these experiential, emotional, and situational understandings and interactions were to be left unexamined, we may have inadvertently created a mismatch between the individual and the environment through a design that could potentially exclude [32]. Our study shows that when carrying out enactive methods together with people with IDD, it is crucial to invest time and adjust resources in establishing a relationship with the participants and to be present in sharing the experience with the participants. This requires separate researchers to take notes during these experiences - who can then reflect and consolidate the notes with the other researchers after the workshop.

The enactive approach and testing of the prototype in realistic settings enabled us to have a contextual frame - and evaluate the prototype beyond its specific functions. The research team could therefore reframe the solution space from transport support to management of unforeseen events. The changing nature of the environment connected to transport activities (i.e. location, passengers, drivers, time) and the interactions in which disability may emerge (i.e. reasoning, behaviour, emotions, communication skills) proved to call for a systemic and relational understanding of the support needed. The enactments of the transport situation allowed us to understand when a gap appeared between the individual, the technology, and the environment and how they influenced each other. The enactive approach challenged our initial insights and showed that several aspects of independent transport do not center on transport itself but around aspects of managing unforeseen events. We propose that our findings are transferable and indeed valuable for innovation processes where disability is not a central concern. This study addresses the challenge of identifying persons' varied perspectives and perceptions in innovation processes and contributes towards anticipating and managing such challenges in research and practice [33].

The study had a limited number of participants and as such could not fully reflect the heterogeneity of people with IDD. The results might therefore not fully reflect the views of people with severe IDD. By the nature of a context specific inquiry there may be further factors influencing our result, that we may not have registered or situations that may not have appeared as a solution nor as a challenge.

5. Conclusion

With digital, mobile solutions serving as an entry point to society in an increasing set of contexts, it is important and valuable to account for how these contexts are experienced by different users. Our prototype for supporting independent travel for people with IDD was explored through enactive methods - a bus workshop and a theatre workshop. We highlight how a closer realistic setting may provide more nuanced, personal, and detailed design insights that support experiential, emotional, and situational understandings. To enable such understandings, it is vital to prioritize time and resources to establish a relationship to the participants and their network. One may deduce that individual lab testing could yield more precise data on the usability of the prototype. However, with such an approach we may not have uncovered the need to reframe our initial solution space of supporting independent transport, to supporting management of unforeseen events. The realistic scenarios allowed for emotional and situational insights to emerge, and we propose that other innovation processes need to account for such experiential elements when designing together with people with IDD.

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