Affordance-Based Pathway Model of Social Inclusion: A Case Study of Virtual Worlds and People With Lifelong Disability

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Abstract

While technology can magnify existing inequalities by excluding marginalized groups in society, paradoxically, it can also serve as a means for them to move from isolation to inclusion. In this paper, we report a study illustrating how individuals belonging to one marginalized group—people with lifelong disabilities (PWLD)—used technology to navigate this path. Our study was part of an initiative by the Norwegian government exploring how PWLD can attain social inclusion (SI) through the use of virtual worlds (VW), specifically Second Life. Using a conceptualization of SI specific to PWLD, which consists of two interrelated domains—interpersonal relations and community participation—we trace how the actualization of affordances in VW enabled PWLD to achieve SI. This outcome was built upon the realization of five interrelated affordances: communicability, mobility, personalizability, engageability, and self-actualizability. Based on these insights, we demonstrate the role of VW affordances in achieving SI and propose a model titled the affordance-based pathway model of social inclusion. We contribute to the discourse on the theory of affordances by extending the role of facilitating conditions. Specifically, the outcomes achieved by the actualization of certain affordances can serve as facilitating conditions that support the perception and eventual actualization of other affordances.

Keywords: Social Inclusion, Virtual Worlds (VW), People With Lifelong Disability (PWLD), Affordances

1 Introduction

More than one billion people in the world have some type of disability (World Health Organization, 2020). The United Nations Convention (United Nations, 2006, p. 4) defines people with a disability as "those who have long-term physical, mental, intellectual, or sensory impairments which in interaction with various barriers may hinder their full and effective participation in society on an equal basis with others." The World Health Organization (2020) classifies nearly 200 million individuals who have chronic impairments that occurred before the age of 22 as people with lifelong disability (PWLD).

The main challenge faced by this large, marginalized group is dealing with isolation and social exclusion (Ballin & Balandin, 2007; Davis & Chansiri, 2019). This challenge is manifested in PWLD being less independent, having less social interaction, and experiencing lower well-being (Simplican et al., 2015). Difficulty in communicating inhibits them from initiating or maintaining friendships, leading to isolation from society (Ballin & Balandin, 2007). When the impact of an impairment is lifelong, this feeling of not being treated as equal to their non-disabled peers can affect their psychological and emotional well-being (Ballin & Balandin, 2007). Consequently, PWLD generally wish to be socially included.
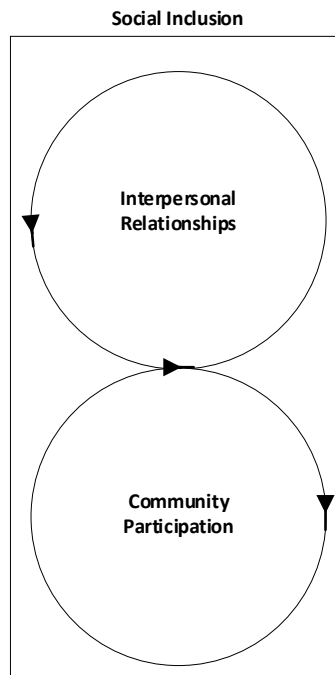
Social Inclusion

Interpersonal Relationships

Community Participation

Figure 1. Domains of Social Inclusion (adapted from Simplican et al. (2015))

The various definitions of social inclusion (SI) emphasize several facets. Even when narrowed to the context of PWLD, this variation prevails. For example, SI has been defined in terms of benefits, such as overcoming social exclusion, empowerment, and a sense of belonging (Mahar et al., 2013). In an extensive review of the literature on SI for PWLD, Simplican et al. (2015) attempted to sort through the confusion. They identified two research streams: what SI is (definitions) and what SI is for (outcomes). They conclude that the conceptualizations of SI converge on two interrelated domains: *interpersonal relationships* (IR) and *community participation* (CP). They are conceptually different but interrelated and mutually reinforcing. (See Figure 1).

Moving from isolation to SI presents significant challenges. Simplican et al. (2015) captured the factors facilitating SI within a comprehensive, multilayered ecological model. This model illustrates that while the barriers to SI are experienced at the individual level, the process of achieving SI is shaped by broader contextual layers. These layers progress from the individual to the interpersonal, organizational, community, and, ultimately, the sociopolitical level. Each layer plays a critical role in shaping the experiences of isolation among PWLD. The model provides a framework for identifying the conditions, premises, and strategies necessary to address isolation and advance toward the two interrelated domains of SI: IR and CP.

The path from isolation to inclusion is, therefore, challenging for PWLD. One potential approach to helping them move along this path is leveraging information and communication technologies (ICT), including virtual worlds (VWs) (Diaz Andrade & Doolin, 2016).

VWs, which are three-dimensional reproductions of the physical world, offer opportunities for entertainment, social settings, employment, and business (Goel et al., 2013). People with disabilities are active users of VWs, as the technology offers a safe environment for them to practice skills that often include actions that pose too much risk in the physical world. Standen and Brown (2005) found that VWs offer an environment in which rehabilitative interventions, such as those promoting skills for independent living, enhancing cognitive performance, and improving social skills, can be achieved. Such interventions are the catalysts behind CP and IR, the two interrelated domains of SI.

The results from these studies are promising. What remains to be answered is what the mechanisms are that lead to these outcomes. Understanding this will help us design interventions based on VW (or technology in general) and support services to help PWLD move toward SI. A theoretical premise for designing such interventions is the theory of affordances espoused by Gibson (1979), which has informed research in human-computer interaction and information systems (IS) (Norman, 1999; Seidel et al., 2013).

Affordances are "the possibilities for goal-oriented action afforded to specified user groups by technical objects" (Markus & Silver, 2008, p. 622). The affordance lens can help us understand how PWLD interact with VWs and consequently perceive and actualize action possibilities to participate in social activities and consequently achieve SI. The actualization of affordances depends on the availability of facilitating conditions, such as support from others. The multilayered ecological pathway model (Simplican et al., 2015) highlights factors that influence an individual's pursuit of SI and points to the role of these facilitating conditions in the process. Examples of facilitating conditions identified in our study include "help from others" and "user training." Accordingly, we propose that the theory of affordances provides a suitable framework for examining how the action possibilities within VWs support PWLD in achieving CP and IR. For instance, VWs can enable PWLD to engage in social activities facilitated by relationships within their network while strengthening these relationships.

Our study was part of a larger project conducted by Molde University College, Norway, under the Strategic College Project funded by the Norwegian Research Council. This project aimed to explore how VWs can be leveraged to enhance social interaction and reduce loneliness among PWLD by facilitating more social engagement and fostering friendships. The VW used in the study was Second Life (SL), which at the time offered (1) a substantial number of users (2) a diverse range of activities, and (3) had been employed in various domains, including business, education, and leisure. Our research question is:

RQ: How do people with lifelong disabilities travel the path from social isolation to social inclusion by realizing the action possibilities of virtual worlds?

To answer this question, we conducted a qualitative study and collected data through in-depth interviews and participatory observation of novice and experienced users of SL.

The remainder of the paper is structured as follows. In Section 2, we first examine how SI has been conceptualized in literature, briefly review the research on PWLD related to SI, and then review the research on ICT and SI. In Section 3, we explore how PWLD have used ICTs, and VW more specifically, before moving on to a detailed discussion of the theory of affordances in Section 4. We then present our research method, describing our study, data collection, and analysis in Section 5. In Section 6, we present our findings. We elaborate on our findings on the relationship between the identified affordances and SI in Section 7. Next, we discuss our findings in Section 8, where we situate them in the landscape of the literature and present the

theoretical contributions of our study. In Section 9, we discuss the implications for research and practice and suggest avenues for future research, concluding the paper in Section 10 with some reflections.

2 Social Inclusion

According to the United Nations (2023): "Social inclusion is the process by which efforts are made to ensure equal opportunities—that everyone, regardless of their background, can achieve their full potential in life. Such efforts include policies and actions that promote equal access to (public) services as well as enable citizens' participation in the decision-making processes that affect their lives."

SI is best understood in contrast to social exclusion, which is defined as the stigmatization or marginalization of a group based on characteristics such as status, gender, race, or disability (Koller et al., 2018). In contrast, SI focuses on enabling and empowering individuals to fully participate in the social activities of the society in which they live (Coleman et al., 2017) and maintain social roles and relationships (Carter & Grover, 2015) while controlling their own resources. As succinctly stated by Bailey et al. (2020, p. 1), SI gives individuals "the ability to participate fully in one's social world." Unfortunately, PWLD often feel segregated and excluded from participating in events and activities that are important in everyday life (Merrells et al., 2019). They face barriers to entering the workforce and are less likely to have interpersonal relationships outside of family ties (Ballin & Balandin, 2007; Merrells et al., 2019).

2.1 Social Inclusion for PWLD

For PWLD, SI occurs in multiple contexts and encompasses various aspects of life (Hall, 2009). For instance, Cobigo et al. (2012) suggest that individuals must experience three conditions to feel socially included: (1) a sense of belonging within a social network that supports their activities and to which they contribute in return, (2) a valued social role, and (3) the community's trust that they will perform their social role. In contrast, Merrells et al. (2019) identified spending time on leisure activities, experiencing meaningful relationships, and feeling included as key aspects of SI. While both perspectives emphasize the importance of relationships and belonging to a community, they tend to conflate the concept of SI ("a sense of belonging," "experiencing meaningful relationships") with its outcomes ("spending time on leisure activities").

Figure 1 shows the conceptualization of SI proposed by Simplican et al. (2015), which consists of two interrelated domains: interpersonal relationships (IR) and community participation (CP). They are conceptually different but mutually reinforcing. The

interaction between these two domains facilitates the achievement of goals such as self-esteem and sense of belonging, and both are necessary for the realization of SI. We adopt this conceptualization of SI.

PWLD can achieve SI through several outcomes. Slade (2009) states that SI gives individuals the right to participate as equals in education, employment, and social and recreational activities. Hall (2009) outlines several factors essential for SI, including acceptance as an individual, relationships, involvement in activities, appropriate living accommodation, employment, and support. She suggests that SI for people with disabilities comprises three key elements: engagement in activities, maintaining reciprocal relationships, and experiencing a sense of belonging. The importance of community in SI is emphasized by Marino-Francis and Worrall-Davies (2010), who argue that SI requires a community that cares for its members, welcomes them, and adapts to meet their needs.

These elements map onto the two domains of SI. CP can be achieved through having equal participation in education (Slade, 2009), experiencing a valued social role within the community that is recognized and trusted (Cobigo et al., 2012), and cultivating a sense of belonging (Cobigo et al., 2012; Hall, 2009). Another factor contributing to CP is involvement in social and recreational activities (Hall, 2009; Merrells et al., 2019). IR is fostered through access to personal networks, which facilitate the development of friendships and close relationships (Carvalhais et al., 2023; Lubbers, 2021). These networks provide social support, ensuring personal assistance in various situations (Lubbers, 2021). Proximity to community members, along with experiences involving parents, friends, and diverse community members, further strengthens IR (Carvalhais et al., 2023).

In summary, certain activities contribute to both enhancing IR and fostering CP. The question that now arises is: *How can PWLD be supported in their pursuit of SI?* As argued earlier, one potential mechanism is the affordances provided by technology (Manzoor & Vimarlund, 2018).

2.2 ICT and SI

The use of technology that provides access to services has been a key focus in the promotion of SI (Danker et al., 2023; Petter & Giddens, 2023). Danker et al. (2023) emphasize the necessity of individualized support for people with intellectual disabilities to utilize mobile technology effectively. Social media platforms also offer various communication methods and access to services (Johannessen & Stendal, 2018; Petter & Giddens, 2023). However, the complexity of technology can be a barrier to its use, which may hinder its potential for promoting SI (Danker et al., 2023; Johannessen & Stendal, 2018).

IS research has primarily focused on designing technology to ensure accessibility and usability for people with disabilities (Bayor et al., 2021). There is a growing body of work exploring the role of technology in facilitating SI (Heath & Babu, 2017). While research has primarily addressed social exclusion related to gender, race, ethnicity, and socioeconomic factors (Heath & Babu, 2017), it has also investigated how ICT supports refugees and immigrants (Abujarour et al., 2021; Diaz Andrade & Doolin, 2016). For instance, Diaz Andrade and Doolin (2016) propose using ICT to support the SI of refugees by facilitating participation in society. Although research advocates digital inclusion through access to online resources for people with disabilities (Bayor et al., 2021), access alone does not necessarily result in SI. Conditions must be present to enable the realization of the opportunities for action offered by technology. Consider social media inclusion, which has been defined as "behaviors that enable an individual's (or group's) access to information, people, or groups and allow one to maintain dignity within a social media environment" (Petter & Giddens, 2023, p. 1254). Applying this definition to technology in general suggests how PWLD can obtain opportunities to engage in society. The insights from the general body of research in IS on SI are useful for establishing the background on the problems and challenges faced by PWLD.

3 ICT Use by PWLD

There is considerable literature on the use of ICT by PWLD. Anderberg and Jönsson (2005) identified three main categories of use of ICT by people with mobility or physical impairment in their day-to-day lives: independence, learning, and communication.

One of the most important aspects of independence is the sense of being in control of one's own life (Gutierrez & Martorell, 2011). Through the use of ICT, PWLD cultivate the ability to make their own decisions, independent of the health professionals or personal assistants who are assigned to them (Gutierrez & Martorell, 2011). One example is assistive technology and computers with internet mounted on a wheelchair, enabling a person with disabilities to move around without assistance. Through social media, people with mobility and intellectual disabilities have the opportunity to meet others, maintain existing friendships, and build new relationships from the safety of their own homes (Ramsten et al., 2020). In special education settings, ICT provides the tools for students to follow and participate more fully in the educational environment (Fichten et al., 2020). Experiments using computer games to train PWLD or using community-based ICT to teach them computer skills have had some success. For example, Coles et al. (2007) reported that children demonstrated improved knowledge after studying street and fire safety through a virtual gaming

environment. PWLD use technology to access the online world and can engage in online interactions with like-minded friends and peers (Söderström, 2009). ICT allows communication through both text and voice, which may help break down communication barriers (Söderström, 2009). With the advent of the Internet of Things and smart technology, people with disabilities experience higher levels of independence (Perez et al., 2023). In summary, these examples show how, through ICT, PWLD can enhance their IR and CP, the two domains of SI.

The decision to conceal a disability, even when the option is available, is influenced by personal choice and self-determination. Numerous online support groups are dedicated to specific disabilities or broader disability-related topics (Babiss, 2009; Johansson et al., 2021; Stewart et al., 2010). These forums and virtual communities facilitate the exchange of information and experiences, which can contribute to reducing the stigma associated with disabilities (Davidson, 2008). Engaging in these discussions allows PWLD to enhance their sense of self-worth by helping one another while also contributing to the education of others and challenging misconceptions (Anderberg & Jönsson, 2005). Acquiring ICT skills may lead PWLD to be perceived as equals when communicating through online platforms (Gardelli, 2008). In summary, ICT enables new forms of communication that can reduce feelings of inadequacy among individuals with disabilities (Gardelli, 2008; Ramsten et al., 2020). As VWs are a specific type of ICT, it is valuable to explore whether the findings discussed in this section extrapolate to the context of VWs.

3.1 PWLD and VWs

VWs are three-dimensional reproductions of the physical world and are defined as "shared, simulated spaces which are inhabited and shaped by their inhabitants who are represented by avatars" (Girvan, 2018, p. 1099).

VWs have three properties that are particularly relevant for PWLD, namely communication, rendering, and interaction (Davis et al., 2009). VWs offer multiple modes of communication, on both individual and group levels, such as text chat, instant messaging, and voice chat. Rendering enables the creation or display of life-like images called avatars on the screen (Davis et al., 2009), allowing people to create and play with their representation in a way not available in the physical world (see Figure 6 for examples of avatars) (Park & Kim, 2022). Interaction is the extent to which users can build and modify form and content in VWs. People may choose to cultivate an extreme look, with clothes and hair that they would not wear in the physical world (Davis & Chansiri, 2019), or create avatars in animal form (Davis & Chansiri, 2019). VWs let users move around without being limited by the laws of physics (Standen & Brown, 2005). For example, they can fly or teleport. PWLD who use mobility aids in real life can walk, run, or dance freely in these virtual spaces (Park & Kim, 2022; Stewart et al., 2010).

In short, VWs offer PWLD an environment that facilitates mobility and social interaction (Babiss, 2009; Stewart et al., 2010) and the ability to protect their privacy and avoid negative physical-world experiences such as humiliation or discrimination (Davis & Chansiri, 2019). Virtual field trips in VWs allow PWLD to explore real-world work demands, thus contributing to career exploration (Elleven et al., 2006). Moreover, VWs support the development of social skills, independent living skills, and vocational skills in individuals with intellectual disabilities (Standen & Brown, 2005). Overall, VWs offer opportunities to enhance SI for PWLD. These impressive outcomes show *what* is possible. How are these outcomes achieved? To explore the *how*, we draw on the theory of affordances.

4 The Theory of Affordances

The theory of affordances, which originates in ecological psychology (Gibson, 1979), refers to the "action possibilities" available to an actor in relation to the environment. These affordances are context dependent and vary across users and situations. A technology may not offer the same affordances to all users or even to the same user in different contexts, depending on the social goals or motivations of the user.

While the theory has received significant attention in IS research (Lanamäki et al., 2016; Thapa & Sein, 2018), there is no shared understanding of what an affordance is. A key debate centers on whether an action possibility must be actualized or perceived to be called an affordance. Lanamäki et al. (2016) term the first as a completed action form of affordance and the second as a potential affordance.

We find merit in both sides of the debate. Once an artifact is designed, it has an action possibility and, hence, a potential affordance. This affordance has to be perceived by the user. This aligns with the "affordance as perceived" stance. But to achieve a goal, this action possibility has to be actualized. This aligns with the "affordance as actualized" stance. In our case, a user (PWLD) must see the affordance of SL and then actualize this affordance to achieve their goal of achieving SI. The two stances are complementary.

How does a potential affordance eventually become actualized? As Gibson stated: "The central question for the theory of affordances is not whether they exist but whether information is available in ambient light for perceiving them" (Gibson, 1979, p. 140). This is an epistemological question, although the ontological view influences its answer (Stendal et al., 2016).

The perception and actualization depend on interpretation, which is shaped by the functional properties of the technology, the user's psychological and physical abilities, and the user's motivation and goals (Glăveanu, 2012). Perception and actualization arise in a specific sociocultural and historical context (Thapa & Sein, 2018). For instance, SL has designed properties that have potential affordances (Park et al., 2008). Yet if a user does not recognize or cannot utilize them, these affordances remain unactualized. Facilitating conditions—sociotechnical arrangements that enable the identification and actualization of affordances—play a crucial role (Hausvik & Thapa, 2017; Thapa & Sein, 2018). For PWLD, help from others to learn to use SL is one such facilitating condition.

Figure 2 shows how affordances are first perceived and then actualized, with facilitating conditions playing a crucial role.

In their trajectory of affordances model, Thapa and Sein (2018) elaborate how goal-oriented actors, such as PWLD, perceive affordances. In some cases, intermediaries may perceive affordances on behalf of PWLD and play a role in actualizing them. Once actualized, affordances lead to outcomes tied to achieving specific goals.

Are all affordances the same in nature? The literature distinguishes between two broad classes of affordances: functional (Seidel et al., 2013) and social (Bradner et al., 1999). *Functional* affordances are connected to an IT artifact's technological features. Individuals can actualize affordances to achieve their goals without a group setup or socializing. *Social* affordances, on the other hand, are defined as the action possibilities created by technology to make social interaction possible (Lankton et al., 2015). They create a link between social environments, interactions, and technologies. Social affordances of an IT artifact are technologically bound and socially constructed, where the users' knowledge and technological skills, together with the context of social interaction, are vital. They facilitate social relationships in groups and communities (Spagnoletti et al., 2015), specifically in the context of social inequality (Hsieh, 2012).

In the case of PWLD, the actualization of functional affordances, such as by entering SL and creating an avatar, is a prerequisite for actualizing social affordances. However, rather than following a strict linear sequence, the relationship between functional and social affordances is dynamic and can be bidirectional. Once functional affordances are actualized, they enable social affordances, which in turn may reshape how functional affordances are perceived and actualized. This interplay mutually reinforces both affordance types over time. The actualization of affordances, often in clusters (Pentland et al., 2015; Thapa & Sein, 2018), helps to achieve SI by fostering IR and CP.

By integrating the theory of affordances with SI, we propose the *affordance-based pathway model of social inclusion* to show how functional and social affordances contribute to achieving SI for PWLD (Figure 3).
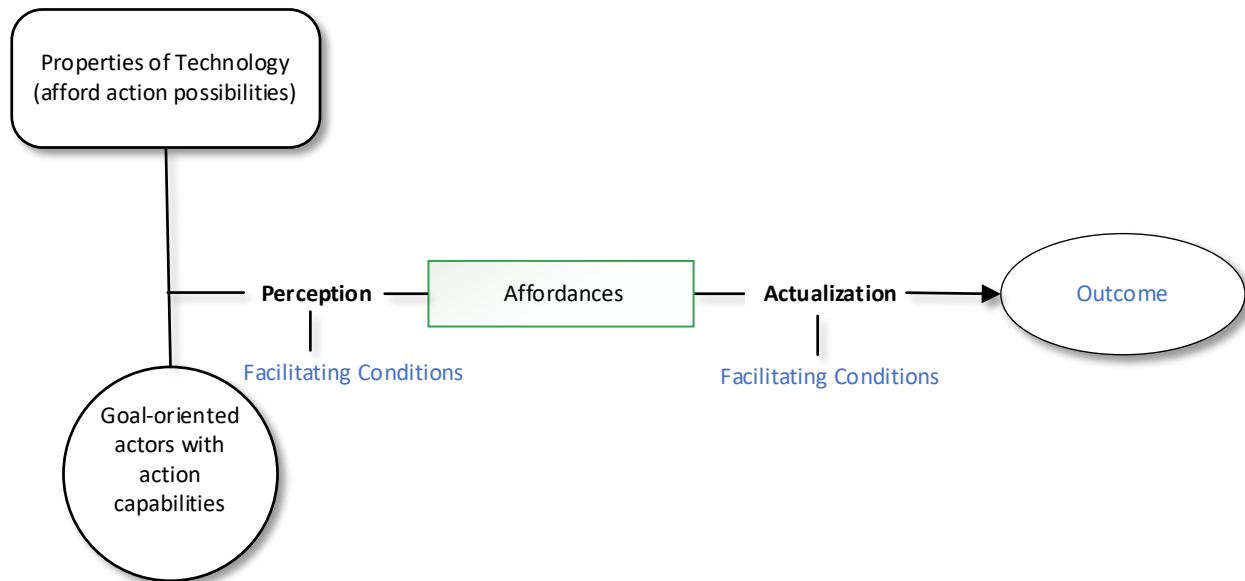

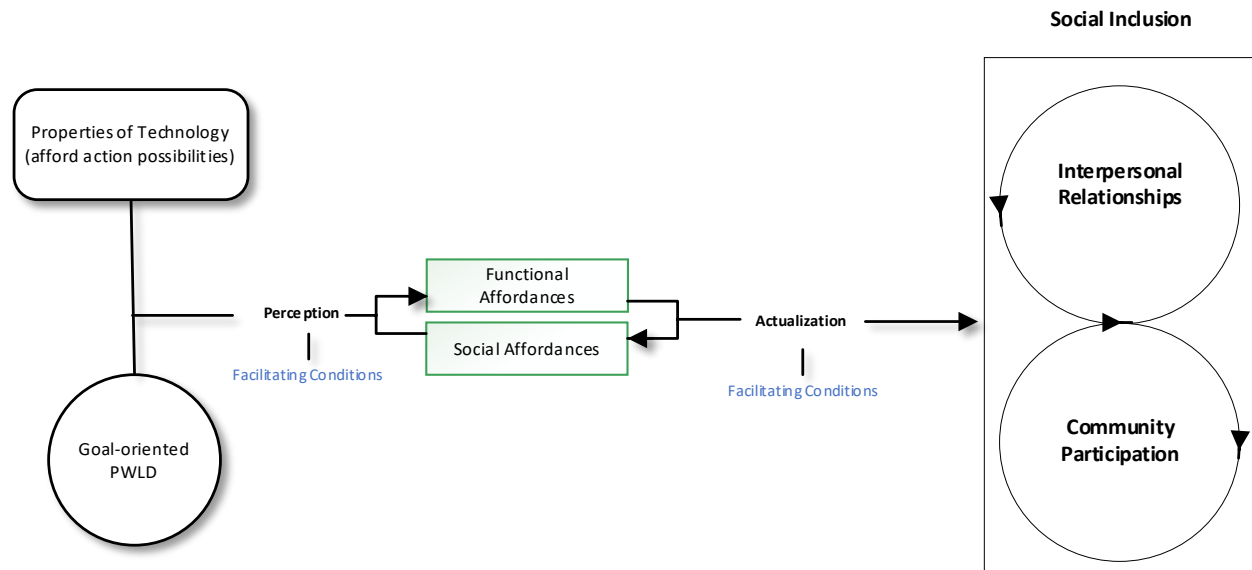
Figure 2. Concept of Affordances

Figure 3. Affordance-Based Pathway Model of Social Inclusion

5 Research Method

As stated earlier, our study was part of a larger project under the umbrella of Norway's Strategic College Project, whose aim was to explore how VWs could help PWLD decrease their loneliness and increase their social interactions.

Our research approach was qualitative. We focused on human interpretation and meanings in keeping with the interpretive research tradition (Walsham, 1995). We used ethnographic data collection techniques through participant observation and in-depth interviews. Consequently, we were able to report our interpretation of the participants' meanings and experiences. We used an iterative process between literature reviews and an empirical study. We conducted an initial literature review to establish the state of the field. We performed further literature reviews as new issues arose during the research process. The previous sections summarize the insights from these reviews. The empirical study involved 18 participants, including 11 novice and 7 experienced users of SL. All participants were aged 18 or older, diagnosed with a lifelong disability, and had access to a computer with broadband. Ethical clearance was obtained from the Norwegian Agency for Shared Services in Education and Research (SIKT in Norwegian), which restricted face-to-face meetings with participants. The project manager and research team members of the Strategic College Project conducted the initial meetings, during which participants provided informed consent and were told that they could withdraw from the project at any time without providing a reason or facing any penalties.

5.1 Recruitment

Novice participants, all from Norway, were recruited through local organizations, such as teaching services, and had no prior experience with SL. Recruitment was facilitated by the research team from the Strategic College Project, who reached out through Norwegian services networks for PWLD. Information about the project was sent to the management of these services, who were asked to invite individuals who could provide informed consent. Interested participants were invited to contact the research team or register their interest with the manager.

Experienced users were recruited with assistance from Virtual Ability, Inc. (virtualability.org), which operates an island in SL (Virtual Ability Island) to support individuals with disabilities who are entering VWs. Attendees participated in presentations of the project in SL. The experienced users had been using SL for 1-7 years. Interested participants received the project manager's contact information to request informed consent forms, ensuring the anonymity of their personal information. Only the project manager of the main project stored participant data. Once informed consent was obtained, the project manager provided us with the participants' avatar names, and we subsequently contacted them in SL to schedule in-world interviews. Six participants were from the United States, and one was from Finland but residing in South Africa.

5.2 Data Collection

Data collection methods differed for novice and experienced users. Novice users who were still learning to use SL were interviewed by phone. SL session times were dedicated solely to activities and in-world

interactions. Over 8 weeks, the 11 novice participants met weekly with the first author for sessions lasting 1.5 hours, engaging in various SL activities such as dancing, horseback riding, riding roller coasters, visiting tourist locations, and flying an airplane (see Appendix A). In the fourth and eighth weeks of the study, all participants were interviewed outside of SL to discuss their experiences in the virtual world. Since all the novice participants were from Norway, interviews were conducted in Norwegian and later transcribed and translated into English.

The experienced users participated in two in-depth interviews, each lasting approximately 2 hours and conducted in-world. These interviews were conducted in English through private instant messaging or private voice chat. Interviews were automatically recorded and stored through SL's log. No planned activities were conducted with the experienced participants, who were free to select the interview location to ensure their comfort during the process. Table 1 lists the study participants, with pseudonyms used to maintain anonymity.

Including the novice participants helped us to understand the initial challenges and opportunities they experienced when engaging in VWs. The inclusion of experienced SL users enabled us to study the long-term effects of using SL for PWLD. The data from both groups offered a more comprehensive understanding of the overall experience of using VWs.

5.3 Data Analysis

We employed thematic analysis, guided by the principles of Braun and Clarke (2006), to analyze the data inductively, allowing themes and patterns to emerge directly from participants' experiences in SL. We did not begin with a predefined theoretical framework and approached the data collection openly, allowing participants' narratives to guide the direction of inquiry. As patterns in the data became clearer, we began to draw on the theory of affordances to interpret how participants interacted with SL's features. For example, when a participant described how SL facilitated communication despite their hearing loss, we recognized emergent affordances related to *communicability*, which influenced subsequent coding and shaped our understanding while we remained responsive to the data.

In line with the emphasis on the active role of researchers (Braun & Clarke, 2006) in constructing themes, we subsequently engaged in a cyclical process of familiarizing ourselves with the data, generating initial codes, and refining themes. This inductive approach facilitated the identification and categorization of affordances. As we deepened our analysis, the affordance lens helped us to refine our understanding of the participants' experiences.

One participant stated: "I have hearing loss, and it's so much easier to communicate with people in SL than in RL. I've friends from all over the world." This quote demonstrates how affordances within SL contributed to SI. Another described SL as a "venue for exploring new ideas and experiences, solo or collaboratively," underscoring how affordances support both individual and collective engagement, which pointed toward dimensions of SI.

Table 1. Participants in This Study

Group	Participant	Disability	Location	Primary language
Novice	Pevit Torana	ID	Norway	Norwegian
	Mix Mofat	ID	Norway	Bulgarian/Norwegian
	Solvita Silka	PD	Norway	Norwegian
	Trinaka Lika	ID	Norway	Norwegian
	Rolatina Endora	ID	Norway	Norwegian
	Gjagra Gralt	PD	Norway	Norwegian
	Missara Melsa	ID	Norway	Norwegian
	Siltar Siana	ASD	Norway	Norwegian
	Sophy Salk	ID	Norway	Norwegian
	Artol Merlit	ID	Norway	Norwegian
	Leos Marth	PD	Norway	Polish/Norwegian
Experienced	Agonra Sircka	PD	USA	English
	Kalnika Gublic	PD	USA	English
	Sunger Alista	PD	USA	English
	Ahroun Wolf	ASD	USA	English
	Maria Butterfly	PD	USA	English
	Kirana Merkini	PD	South Africa	Finnish/English
	Landira Crunge	PD	USA	English
Note: Abbreviations: mild to moderate intellectual disability (ID), physical disability (PD), autism spectrum disorder (ASD).				

Table 2. Identified Affordances

Affordance	Definition	Original text
Functional		
Communicability	Ability to communicate and interact with others in SL	*"It´s easier to <u>interact with people</u> here; I don't need sign language."* (Kirana Merkini)
Mobility	Ability to explore virtual spaces with the same freedom as people without a disability	*"In RL [real life] I can't dance; <u>here I can dance with the stars.</u>"* (Maria Butterfly)
Personalizability	Ability to personalize avatars and continually make changes to represent oneself in a manner with which one feels comfortable	*"Personality-wise, it's the same as the RL [real life] me, except when I'm in a <u>tiny fox avatar</u> or just playing around with other creature avatars."* (Landira Crunge)
Social		
Engageability	Ability to socialize through engaging in activities with others in the virtual environment	*"No, I want to <u>dance with him</u>."* (Sophy Salk)
Self-actualizability	Ability to socialize through realizing one's potential and feeling empowered to contribute to the well-being of others	*"Well, social aspect for one. I'm retired and live alone, so it gives me something to do. Also, since I'm a former teacher, <u>helping newbies is something I enjoy</u>."* (Landira Crunge)

Throughout the research process, our understanding of affordances and their role in SI developed. Initially, we focused on broad insights from participants. However, as specific affordances became apparent, we refined our analysis to align with these emerging patterns. This inductive approach allowed us to maintain theoretical consistency while incorporating participant feedback. Our findings demonstrated that SL enabled participants to overcome physical and societal constraints, with affordances contributing to dimensions of SI. As one participant noted, "This is my home, more so than the four walls of drywall and wood that set the boundaries of my bedroom," highlighting how SL's affordances facilitated unrestricted social interactions.

The iterative nature of our approach was crucial in refining our theoretical framework. As themes of IR and CP emerged, we continually revisited the theoretical constructs to ensure alignment with participants' experiences.

5.4 Validity Issues

We implemented measures to validate our results. To ensure transparency, we documented our research steps in detail. Additionally, we conducted two presentations within SL at Virtual Ability Island, where participants from the study, along with non-participants and other researchers, provided feedback on our findings. This feedback helped to validate our interpretations. Participants were invited to comment on the accuracy of the findings, and all feedback was positive. Conducting research in a VW presents ethical challenges that differ from those in the physical world (McKee & Porter, 2009). As researchers must participate in the VW to study it, issues arise such as representation, privacy, and responsibilities to stakeholders. We identified ourselves

as researchers while in our research roles. We also ensured that participants knew they were part of a research project and that they would only be able to interact with researchers for a limited time.

6 Findings

We identified five VW affordances for PWLD (see Table 2). We classified the first three: *communicability, mobility,* and *personalizability,* as functional affordances. The outcome of the actualization of functional affordances generated two social affordances: *engageability* and *self-actualizability*. The actualization of virtual world affordances may not always follow a linear progression. For instance, socialization can, at times, aid in the recognition of functional or social affordances.[1] Our findings indicate that to actualize social affordances such as *engageability* and *self-actualizability*, one must first actualize the functional affordances. Tasks such as creating an avatar require the actualization of *personalizability*, and to enable communication and movement within the virtual space, one needs to actualize *communicability* and *mobility*. At the same time, the actualization of social affordances also led to a sharpening of the understanding of functional affordances. Later in the paper, we explain how functional and social affordances are related and discuss their effects on two domains of SI: IR and CP.

6.1 Functional Affordances

The three functional affordances that we identified, *communicability, mobility,* and *personalizability,* arose from the action possibilities of the technological properties of SL. We describe them below.

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[1] We are indebted to the senior editor for this insight.

6.2 Affordance 1: Communicability

Communicability emerged from the relationship between the SL properties of communication and the PWLD, with the goal of communicating with a larger group than they had communicated with in the physical world. Landira Crunge indicated that the ability to communicate through text was one of the main reasons that SL was a valuable tool for her: "One [reason] is my hearing loss, and I don't for the most part have to worry about understanding someone as they will type." Kirana Merkini also stated that communication by text made it easier for her in SL: "It's easier to interact with people here; I don't need sign language."

From our observations of slow and choppy typing, it was clear to us that some participants with a physical or intellectual disability had difficulty actualizing communicability because they could not use a keyboard. "It is hard, because it is hard to find the letters" (Rolatina Endora). While the voice feature enabled communication for this group, we observed that those with hearing impairments felt excluded from events arranged based on voice communication. However, the facilitating condition that helped them to actualize this affordance was "help from others." As seen in Figure 4, after actualizing *communicability*, PWLD can interact and connect with others, which can enable IR.

6.3 Affordance 2: Mobility

Mobility emerged from the relationship between the SL property of interaction and the PWLD, with the goal of moving freely without being encumbered by their disabilities. This allowed them to engage in a range of activities free from the physical constraints and limitations imposed on them by the physical world: "In RL [real life] I can't dance; here I can dance with the stars" (Maria Butterfly). Gjagra Gralt, who has severe

physical disability and uses a wheelchair in the physical world, had a new experience when she was able to dance. As Maria Butterfly explained, "Maria [her avatar] taught me how it would be like to have an able body and went through the motions of having an able body."

In the physical world, people with a physical disability are often dependent on others to move around. People with an intellectual disability are often closely supervised, and decisions to visit unfamiliar places or move around in their local community are typically made by caregivers or family members. Mobility gave PWLD the ability to visit locations from the safety of their own home. During observation sessions, the first author showed new participants the possible actions, such as flying, and, in turn, explained how mobility could be achieved. As indicated in Figure 5, after actualizing *mobility*, PWLD attained the independence to participate in activities that can contribute to CP.

6.4 Affordance 3: Personalizability

Personalizability emerged from the relationship between the SL properties of rendering and the PWLD, with the goal of being able to choose what to disclose or being anonymous if desired. Figure 6 shows an avatar (the actual avatar the first author used while interacting with the study participants). Agonra Sircka uses a wheelchair in the physical world; in SL, his avatar also uses a wheelchair. He spends considerable time in SL volunteering on Virtual Ability Island and feels that displaying his disability through the avatar helps to break the ice when communicating with novice users: "In Virtual Ability, most folks have disabilities of some sort. Some are still learning to be 'okay' with that … to integrate that into who they are. I think it helps some people to talk about it" (Agonra Sircka).
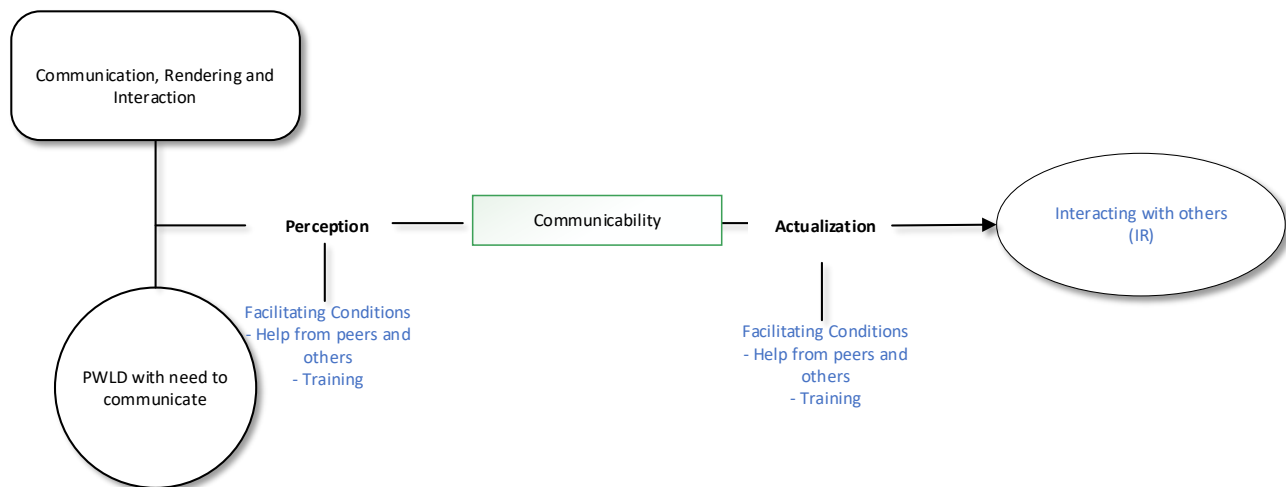

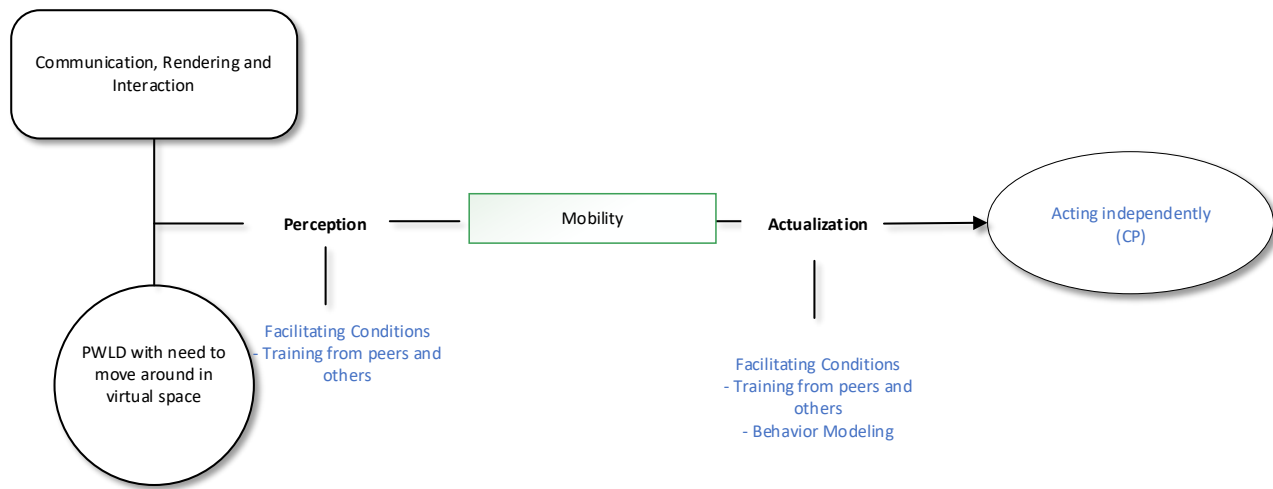**Figure 4. Trajectory of Communicability Affordance**

Figure 5 Trajectory of Mobility Affordance

Figure 6. Personalization of an Avatar

Only two of the 18 participants discussed their disability during their sessions in SL. Some of them could not understand why one would want to bring a disability into SL when it is not necessary, as prejudice can be present in VWs. As Missara Melsa said: "It suits me well [to be anonymous]. Because I have had problems on Facebook, I like to be anonymous in places like this. I disclose very little about myself if I don't know whom I am speaking with."

Personalizability is the ability to experiment with various representations of personality traits. Ahroun Wolf, the only participant choosing to be represented by a non-human avatar, stated that he chose a wolf avatar because it represented his personality. As Landira Crunge, who plays with different avatar forms in SL,

explained, "Personality-wise, it's the same as the RL [real life] me, except when I'm in a tiny fox avatar or just playing around with other creature avatars." When asked how switching between human and non-human representation felt, she answered, "Fun. It's like you can take on a whole different personality." Leos Marth, a female in the physical world, chose a male avatar to represent her in SL: "I like boys, that is why I wanted my avatar to be a boy."

Actualizing *personalizability* involves changing the avatar's physical appearance (body shape, size, color, etc.), which, in SL, is a standard procedure with multiple steps. However, when changing the avatar's clothing, hair, or accessories, there are no set standards, which makes this challenging for participants with an

intellectual disability. "It was hard to change clothing; I couldn't do it" (Trinaka Lika). When they wanted to change their avatar, they needed extensive assistance from the first author during the participatory observation. Once again, help from others acted as a facilitating condition for actualizing *personalizability*. As seen in Figure 7, actualizing personalizability enables PWLD to choose what to disclose and meet others on equal terms, which can contribute to CP.

6.5   Social Affordances

The two social affordances we identified, *engageability* and *self-actualizability*, are action possibilities created by technology to facilitate social interaction. We describe them below.

6.6   Affordance 4: Engageability

Engageability emerged through the actualization of the three functional affordances—*mobility, communicability,* and *personalizability*—and the PWLD, with the goal of taking part in social activities. Since achieving this goal required the PWLD to be able to move freely, communicate well, and present themselves as they wished to be seen (e.g., with or without disclosing their disability), the actualization of the functional affordances was essential. Consider this quote from Maria Butterfly: "In RL [real life] I can't dance; here I can dance with the stars." The first part, "here I can dance," is the actualization of the mobility affordance. The second part, "with the stars," points toward being engaged in a social setting, which is the definition of Engageability. As Artol Merlit put it, "It is great to meet new people. We should try to meet more new people." During the participatory observation sessions, the novice participants continued to ask for locations where they would be near other avatars. When

taken to a location where there were other avatars present, the novice users spent the entire session in that location. When they engaged in activities such as dancing in a location without other avatars nearby, they soon became bored. Although they still wanted to dance, it was important to be around others. Sophy Salk had the opportunity to dance with a male avatar on the Norwegian island in SL. She did not like the style of the dance. When shown by the first author how she could choose her own style of dancing, she answered, "No, I want to dance with him." Dancing with a specific individual was more important than the style of dance. When asked what she liked best, Sophy Salk answered, "Being with others!"

There were constraints on the actualization of *engageability*, especially for subjects with an intellectual disability. Most of the novices in this category interacted only with other participants and did not create friendships with non-participants. Those who attempted it found it difficult to approach others. As Agonra Sircka explained:

> *Accessibility—how to overcome the barriers successfully—to move quickly toward a level of independent mastery. The goal should be interacting—with the VW and with others—not just having to figure out how to do that.... A lot of folks with disabilities have to spend disproportionate amounts of their life "figuring out" how to do things that others take for granted. If that "learning curve" can be short in a VW, then people with disabilities can be equals in actual interactions.*

As Figure 8 shows, after actualizing *engageability*, PWLD could participate in activities and be part of the community. Such outcomes contributed to both CP and IR.
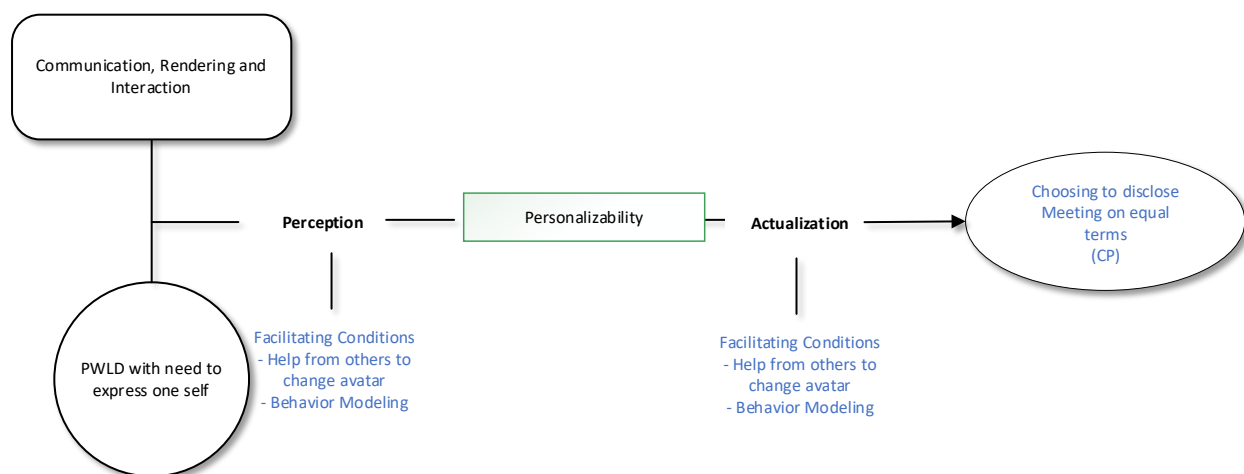

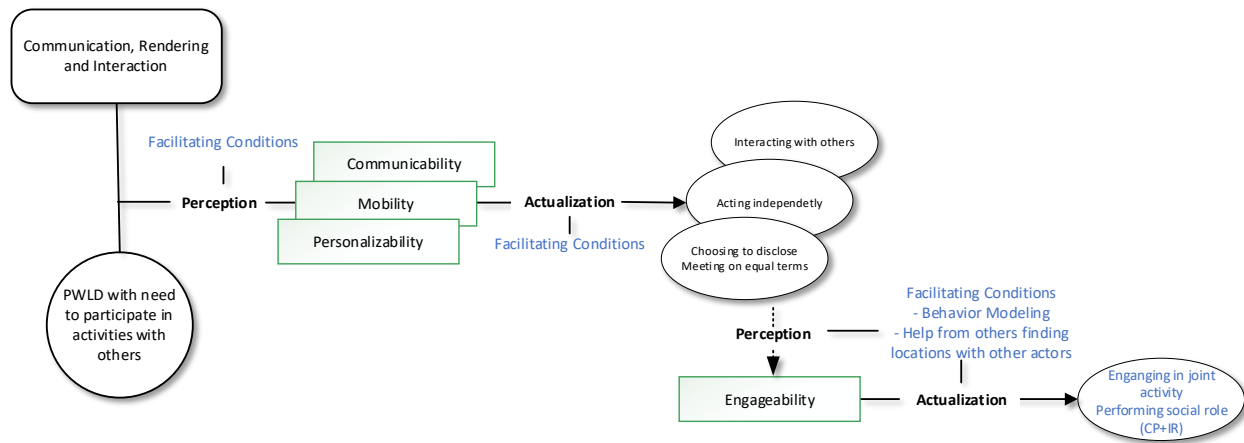**Figure 7. Trajectory of the Personalizability Affordance**

Figure 8. Trajectory of the Engageability Affordance

6.7 Affordance 5: Self-Actualizability

Like *engageability*, the emergence of *self-actualizability* also required actualizing the three functional affordances and the PWLD having the goal of feeling like "normal" people with the same aspirations. This affordance enabled PWLD to socialize by realizing their potential and feeling empowered, and consequently contributing to the well-being of others. The actualization of self-actualizability can be manifested only in interacting with others in a social setting. Hence, we classified it as a social affordance.

An example of realizing one's potential is learning how to use technology. For our subjects, the learning curve for using SL was steep and at times challenging, especially for the novice participants who used SL for only eight sessions. Gjagra Gralt found her first weeks in SL difficult but very educational and fun. Mastering the technology made her feel empowered and made her time in SL very enjoyable. Leos Marth said, "It is a little hard, but it is getting better; I want to get good at this." Although learning was complex, the novice participants felt that the progress they made was important in and of itself. This was illustrated in the final session when Trinaka Lika exclaimed with a cheer that she had managed to teleport without assistance: "I teleported on my own the last time; it became easier." In the participatory observation sessions, we observed how Trinaka Lika moved from perceiving the affordance to actualizing it.

The actualization of *engageability* also led to the emergence of *self-actualizability*, which implies that the constraints related to the actualization of engageability were inherited. One form of engaging in activities with others is helping others to use the properties of SL. A striking example of this was provided by Landira Crunge, who abandoned SL because of a lack of support in learning how to use the technology. However, when she returned, with a friend in SL helping her to use it, she even started helping other PWLD to overcome the initial barriers.

Some participants, such as Maria Butterfly, who had previously used VWs in formal education, decided to continue using SL to take other classes and courses offered. She thus became a part of the community, which led to personal growth, especially when she was able to help others. We found numerous examples of this in our study. In Virtual Ability Island, some participants, such as Landira Crunge, volunteered to help novice users overcome the initial barriers to entering SL. Sunger Alista worked with people by building objects in SL to help them use SL. Mix Mofat enjoyed helping other participants in his group to use SL when possible. Gjagra Gralt assisted her teacher by teaching other PWLD how to use and enjoy SL as much as she herself did. Figure 9 shows how PWLD experienced the joy of helping others after actualizing *self-actualizability*, which contributed to CP.

6.8 Facilitating Conditions

Although our participants faced numerous barriers that inhibited their progress on the path toward SI, all were able to perceive and actualize the identified affordances because facilitating conditions were present (see Table 3). One of the main facilitating conditions that is needed to actualize all five affordances was "help from others." Assistance provided by support staff, peers, and the first author helped participants to overcome initial entry barriers and acquire confidence in utilizing SL without continued assistance. Landira Crunge illustrated this:

> *A friend told me about it and suggested I might like it. I did come in with another avatar back in 2007, but could not figure out what I was doing. So, I left. The same friend talked me into coming back about six months later, and this time she helped me get oriented.*
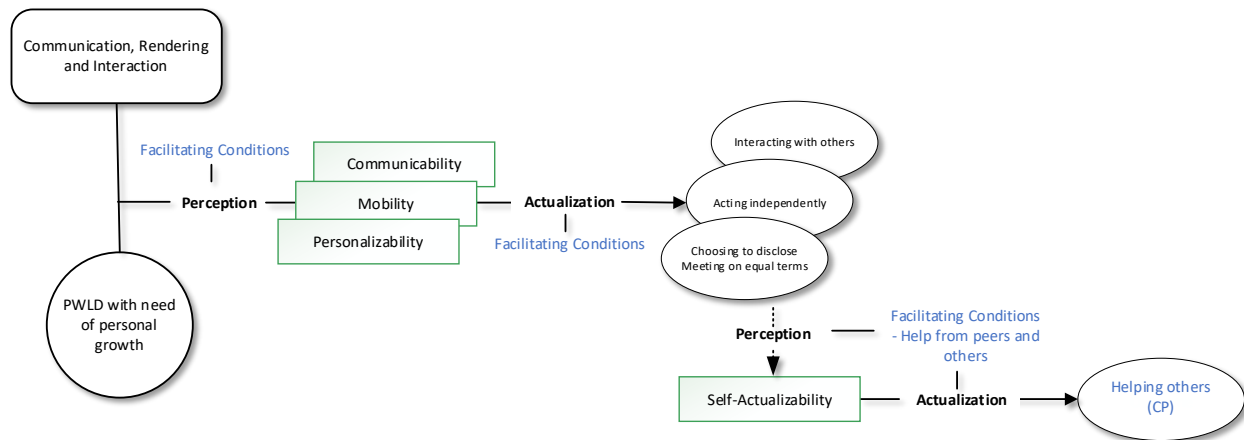
In this case, help came from a peer.

Figure 9. Trajectory of Self-Actualizability Affordance

Table 3. Summary of Affordances and Facilitating Conditions

Affordance	Facilitating conditions	Original text
Functional		
Communicability	User training, help from others	*"Yes, there are exceptions. BURN2 core group does a lot of voice. They will text for me if I can't understand them. But most of my interactions with folks are via text chat."* (Landira Crunge)
Mobility	Help from others, actualization of communicability	*"A friend told me about it and suggested I might like it. I did come in with another avatar back in 2007, but could not figure out what I was doing. So, I left. The same friend talked me into coming back about 6 months later, and <u>this time she helped me get oriented</u>."* (Landira Crunge)
Personalizability	Help from others, user training	*"It was hard to change [look of avatar] on my own, <u>I needed help for that</u>. Like that it can be changed."* (Missara Melsa)
Social		
Engageability	Outcome of actualization of all functional affordances, help from others	*"Socializing mostly, I've found many friends here."* (Kirana Merkini)
Self-actualizability	Outcome of actualization of all functional affordances, help from others	*"But it fits my personality. And I like it, so I use it a lot. I'm a kind of cool guy in RL, and I tried to portray that in my avatar, as well."* *"When I hang around Virtual Ability places, <u>I think it also opens up conversations a bit. In Virtual Ability, most folks have disabilities of some sort. Some are still learning to be 'okay' with that.... to integrate that into who they are. I think it helps some people to talk about it.</u>"* (Agonra Sircka)

6.9 Relationship Among Affordances

Our findings show that the actualization of functional affordances and their outcomes led to the perception of social affordances. For PWLD, *communicability* provides the first step toward interacting and socializing with others in SL. The actualization of communicability led to the perception of *engageability,* which in turn led to *self-actualizability*. Communicating is also vital for a feeling of well-being and the development of self-confidence, which are the foundations of self-actualizability. Actualization of the functional affordance of *mobility* led to the perception of the social affordance of *self-actualizability*.

The third functional affordance, *personalizability*, fostered social engagement and thus led to the emergence of *engageability*. The ability to personalize the avatar to display the individual and not the disability was deemed important:

> *Because I had to "convince" people that I was a person in RL. Once I did that, it would go fine. I guess I don't understand why some insist on bringing their disabilities in here. Well, it would be so easy not to. Heard them say, "It's part of my identity." I never thought of it in that way, I guess. I see how people move away from people with disabilities in here. (Kalnika Gublic).*

In contrast, Agonra Sircka felt that showing his disability created a closer link to other people with a disability. It gave him a unique opportunity to socially engage by having conversations about dealing with their disabilities and being comfortable with them:

> *This avi [slang for avatar] I designed for use when I am doing trainings. I designed it this way ... well, originally with more business attire ... because of my plans to influence my boss. But it fits my personality. And I like it, so I use it a lot. I'm a kind of cool guy in RL, and I tried to portray that in my avatar as well. When I hang around Virtual Ability places, I think it also opens up conversations a bit. Less so elsewhere in SL, where many of the same prejudices as in RL are equally rampant.*

He continued, "In Virtual Ability, most folks have disabilities of some sort. Some are still learning to be 'okay' with that ... to integrate that into who they are. I think it helps some people to talk about it." This illustrates a link between the functional affordance of *personalizability* (whether or not to reveal a disability) and the social affordance of *self-actualizability* (the ability to contribute to the well-being of others).

Similarly, Ahroun Wolf's experience highlights how functional affordances led to social affordances:

> *This is my home, more so than the four walls of drywall and wood that set the boundaries of my bedroom. This is the place where my peers generally reside, where my social involvements are had, and as I mentioned, metaphorically speaking, in this place ... I'm a god. Here, I choose my own destiny in a way no one can in the physical world."*

The functional affordances of SL allow him to shape his environment and social experiences, reinforcing both his engagement with others and his sense of self-actualization. These examples illustrate how functional affordances not only enable social interactions but also contribute to personal fulfillment within virtual spaces. Agonra Sircka indicated that SL enabled him to participate and engage in activities independently of caregivers:

> *Easier in a lot of ways—fast. It can take an hour or more to get ready (dressed) to go out in RL [real life] for me, and I need my PCA*

> *(personal care attendant). To use SL, all I have to do is log in. It takes a lot of physical work to "go out" for me—this doesn't [in SL]. And I can "hang out" with friends for a short time—an hour, if that is all I have."*

We also identified a relationship between the two social affordances: *engageability* and *self-actualizability*. Landira Crunge described what was crucial in SL: "Well, social aspects for one. I'm retired and live alone, so it gives me something to do. Also, since I'm a former teacher, helping newbies is something I enjoy." Here, the ability to navigate and interact within SL (a functional affordance) facilitates her engagement with others and allows her to help newcomers. This meaningful interaction fosters a sense of self-actualization, demonstrating how engageability can lead to self-actualizability.

In discussing the relationship between functional and social affordances in Section 4, we postulated that this relationship can be bidirectional. While the actualization of functional affordances can lead to social affordances, the reverse can also be the case—the actualization of social affordances can, in turn, reshape how functional affordances are perceived and actualized. We found evidence for this dynamic and bidirectional relationship.

Functional affordances provide technological possibilities that enable social interactions and shape the development of social affordances. However, this relationship too is not strictly linear.

Our findings show that social engagement, resulting from the actualization of *engageability* and *self-actualizability*, can also influence the use and refinement of functional affordances. A striking example is the case of Agonra Sircka, who helped other participants by having conversations with them about dealing with their disability and being comfortable with it. He disclosed his own disability by actualizing the functional affordance of *personalizability*. He designed his own avatar "for use when I am doing trainings. I designed it this way ... well, originally with more business attire ... because of my plans to influence my boss." Through helping others, he actualized the social affordance of *self-actualizability*. Seeing it this way, it illustrates how functional affordances lead to social affordances.

However, this link is not unidirectional, as Agonra Sircka discovered: "When I hang around Virtual Ability places, I think it also opens up conversations a bit." In his conversations, he taught other participants how to design avatars that suited their personalities and purpose. He was helping others to actualize *personalizability*. This led him to sharpen his understanding of personalizability. We can see that the link is reversed here—a social affordance (self-actualizability) has led to greater awareness of a functional affordance (personalizability).

For PWLD, *communicability* is essential for initiating interactions and socializing with others in SL. The actualization of communicability fostered the perception of *engageability*, which in turn influenced the development of *self-actualizability*. Our findings show that the resultant outcome of social engagement can also influence the use and refinement of communicability.

During participatory observation sessions, the novice participants preferred locations where they could be near other avatars. When placed in such settings, they spent the entire session there, whereas in locations without other avatars, they quickly became bored. Even though they still wanted to engage in activities such as dancing, their motivation to continue was driven by the presence of others. This indicates that a desire for social connection (*engageability*) can influence how functional affordances such as *mobility* are perceived and actualized.

7 Relationship Between Affordances and Social Inclusion

In Section 3, we illustrated *what* could be achieved by PWLD to obtain SI through VWs. The extant literature does not reveal *how* it is achieved. Through our research, we reveal *how* technology, through its affordances, influences the pathway to SI. Previous research has shown that engaging in collaborative activities with others in the virtual environment leads to an increased feeling of social presence (Schultze & Brooks, 2018). Our framing of this engagement as an affordance—*engageability*—sheds light on how this happens.

The actualization of functional and social affordances, both on their own and in clusters, sets PWLD on the path toward the two domains of SI: IR and CP. Subsequently, the achievement of SI enabled PWLD to attain specific outcomes. We capture this trajectory in Figure 10 (built on our pathway model shown in Figure 3) and in Table 4, which details how the actualization of the clusters of affordances led to the two domains of SI.

For example, actualizing Mobility led to Self-actualizability, which together enabled PWLD to develop social networks, which are essential elements of IR. Being included allowed PWLD to achieve their goals of developing and maintaining social connections. Actualizing Self-actualizability through helping others enabled our participants to enhance IR, which in turn led to the PWLD goals of feeling like a part of society and giving something back. As Landira Crunge puts it, "SL has given me a reason to exist more than just because of my kids. I do feel a sense of being needed in SL more so than in RL [real life]." She further stressed the importance of having a valued social role in a group: "Like listening to another who has problems. Just being there for them." Sunger Alista expressed that being part of a social network was important to her: "Well, I have a sense of identity as part of a group with shared experiences and values." The level of interpersonal relationship grows from acquaintanceship to trusted friendship. The link between VWs and SI is tellingly summed up by Ahroun Wolf: "I have none without my computers. Without my cocoon of technology ... there would be no quality to my life at all." A key aspect of CP is the community's trust that individuals will perform their social role, succinctly expressed by Sunger Alista as follows: "I have a sense of mutuality—I both give to the group members and receive from them."
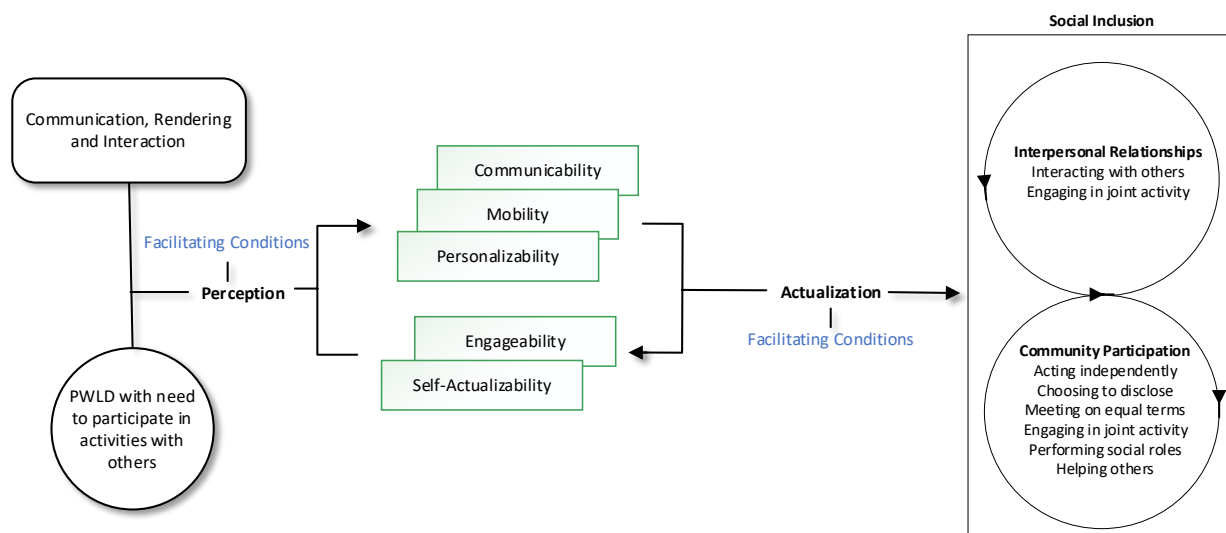

Figure 10. Summary of Findings of Affordance-Based Pathway to Social Inclusion

Table 4. Relationship of Affordances Leading to Social Inclusion (SI)

Affordances	Pathway to SI	SI domains	Original text
Communicability → Engageability	Functional → Social → Engaging in activity	Interpersonal relationship	*"Predominantly to maintain connections with people I already know from SL. At one point, I did seek out new social contacts, but that's gotten to be few and far between. I would like to get back to meeting new people. I met my mate here after all. I hate missing the opportunities to meet other quality people to call friends and companions."* (Ahroun Wolf)
Engageability → Self-actualizability	Social → Social → Helping others	Community participation	*"Well, social aspects for one… I'm retired and live alone, so it gives me something to do… Also, since I'm a former teacher, helping newbies is something I enjoy."* (Landira Crunge)
Mobility → Self-actualizability	Functional → Social → Helping others	Community participation	*"In RL [real life] I can't dance; here I can dance with the stars."* (Maria Butterfly)
Personalizability → Engageability	Functional → Social → Engaging in activity	Interpersonal relationship	*"Except when I'm in a tiny fox avatar or just playing around with other creature avatars." (*Landira Crunge)
Personalizability → Self-actualizability	Functional → Social → Helping others	Community participation	*"This avi [avatar] I designed for use when I am doing trainings. I designed it this way ... well, originally with more business attire ... because of my plans to influence my boss. But it fits my personality. And I like it, so I use it a lot. I'm a kind of cool guy in RL, and I tried to portray that in my avatar, as well. When I hang around Virtual Ability places, I think it also opens up conversations a bit."* (Angora Sirca)

8 Discussion

Our study contributes meaningfully to the discourse on SI and the theory of affordances. Below, we elaborate on salient aspects of our contributions.

8.1 Contribution to the Literature on Social Inclusion

The affordance lens offers additional insights into findings in online communities focused on health issues. Wu and Bernardi (2020) found that participation in a diabetic group provided participants with a sense of community, which aligns with the CP domain in our model. The actualization of the *engageability* affordance facilitated this sense of community. One participant mentioned experiencing a "sense of mutuality," which resulted from actualizing *self-actualizability* and contributed to CP. *Mutuality* closely resembles Wu and Bernardi's (2020) "reciprocity." We suggest that engageability and similar affordances in the online community are comparable to properties in their study.

Feeling that one is a part of society and able to give back and help others is important for PWLD in the physical world, but they are often deprived of the opportunity to do this (Gutierrez & Martorell, 2011). Consequently, they do not feel that they participate in all facets of the community. Our participants actualized *self-*

actualizability through helping peers learn how to use SL. This is a significant outcome because Söderström and Ytterhus (2010) have shown that the complexity of a technology may prevent or discourage PWLD from using it, which we also observed. Stewart et al. (2010) considered VWs a suitable environment for PWLD to help and enjoy the feeling of participating by giving back to society through volunteer work.

Our findings provide a conceptual and theoretical grounding for the role of information technology in the discourse on SI. Simplican et al. (2015) identified four research agendas on SI that can be based on their ecological model: (1) sustaining organizational interventions, (2) the role of families, (3) people along a broader spectrum of disability, and (4) the role of communities. To this list we add a fifth agenda: (5) the role of technology.

Simplican et al.'s model (2015) defines the state of SI; it does not explain the mechanism by which SI can be achieved. We contribute to the SI literature by enhancing the pathway model through the addition of the affordance lens: an *affordance-based pathway model of social inclusion* (Figures 3 and 4).

Table 5 shows how our findings (summarized in Table 4) address the SI challenges faced by PWLD and their desired goals as mentioned in the literature. The first three rows relate to the outcome of engaging in social activities,

and the last two to the outcome of helping others. One of the challenges is the need for individuals to participate fully in the social activities of society (Coleman et al., 2017). Our findings demonstrate that the affordance of *communicability*, which leads to *engageability*, plays a crucial role in enabling individuals to participate in social activities and grow within them. Engageability creates a bridge that allows individuals to reach their full potential in these societal activities.

Another goal identified in the literature is the ability to maintain social roles and relationships while retaining control over one's own resources (Carter & Grover, 2015). Our findings show that the affordance of *personalizability*, which leads to *engageability*, fosters the ability to engage in activities that help individuals maintain social connections. Personalizability supports the alignment of one's virtual presence with one's social roles to reflect individuality and enhance relationships.

The literature also emphasizes the importance of forming interpersonal relationships outside family ties (Ballin & Balandin, 2007; Merrells et al., 2019). Our findings show that the affordance of *communicability*, which leads to *engageability*, encourages individuals to participate in activities or communities. This engagement increases the likelihood of forming social connections beyond family, highlighting the potential of VWs to support broader social networks. Another

challenge is overcoming social exclusion to achieve empowerment and foster a sense of belonging (Mahar et al., 2013). Our findings show that the affordance of *personalizability*, which leads to *self-actualizability*, plays a key role in empowering individuals. By enabling self-expression, personalizability helps individuals to feel included, in control, and able to fulfill their potential. This, in turn, contributes to a sense of belonging and empowers individuals to help others.

Actualizing the five affordances can enable PWLD to experience another condition of being socially included (as indicated by Cobigo et al., 2012): having a valued social role of contributing to and supporting the community. Actualizing *engageability* and *self-actualizability* helped PWLD to meet another condition identified by Cobigo et al. (2012): the community's trust that an individual will perform their social role.

Finally, the literature emphasizes the importance of being in control of one's resources (Carter & Grover, 2015). Our findings demonstrate that the affordance of *mobility*, which leads to *self-actualizability*, supports autonomy in accessing resources. Mobility in virtual spaces allows individuals to independently navigate and control their environment, which is essential for self-actualization. This autonomy promotes personal growth and enables individuals to assist others, furthering social inclusion.

Table 5. Mapping Affordance Pathways Onto Literature Findings on Social Inclusion

SI challenges/goals in the literature	Our findings		Explanation
	VW affordance	Outcome	
Participating fully in social activities of the society where one lives (Coleman et al., 2017)	Communicability → Engageability	Engaging in activities	Engageability provides the basis for an individual to not only participate but also thrive in societal activities and achieve one's full potential.
Maintaining social roles and relationships (Carter & Grover, 2015) while being in control of one's own resources	Personalizability → Engageability	Engaging in activities	Personalizability fosters the ability to maintain social connections by reflecting individuality and aligning one's presence with one's roles in social contexts.
Likelihood of having interpersonal relationships outside of family ties (Ballin & Balandin, 2007; Merrells et al., 2019)	Communicability → Engageability	Engaging in activities	An individual needs to communicate to engage in activities or communities. Consequently, one is more likely to form social connections with people outside one's familial network.
Overcoming social exclusion, empowerment, and sense of belonging (Mahar et al., 2013)	Personalizability → Self-actualizability	Helping others	By enabling self-expression, Personalizability contributes to empowerment and the fulfillment of one's potential. One manifestation of this is helping others, which results in PWLD feeling included and in control.
Being in control of one's own resources (Carter & Grover, 2015)	Mobility → Self-actualizability	Helping others	Mobility enables users to access resources autonomously, facilitating control and independence, which are central to self-actualization. As discussed above, this is manifested in helping others.

8.2 Contribution to Literature on the Theory of Affordances

In elaborating our contribution to the theory of affordances literature, we begin by placing the five affordances that we identified in the landscape of prior research on what affordances are. While each of the affordances resonates with prior research, we offer fresh perspectives.

One of the affordances that we identified, *communicability*, enables PWLD to communicate with others through SL. Previous research has identified communication as a key feature of VWs (Voinov et al., 2018) and conflated the technology feature as an affordance. We define communicability as an affordance because it refers to an action possibility that emerges in the relationship between VW properties and PWLD who have the goal of communicating with others, which is not a system feature embedded in the technology.

Mobility enables PWLD to move freely within a virtual environment. Other researchers have identified mobility as an important part of the "expanded sense of possibilities" offered by VWs (Cooper et al., 2018).

Personalizability enables PWLD to choose what to disclose. While the ability to create an avatar to represent the personality that an individual wants to display has been identified as important in previous research (Schultze & Leahy, 2009), it had not been conceptualized as an action possibility for achieving a desired outcome. By framing this ability as an affordance, we establish a premise for developing initiatives (e.g., services) to help PWLD achieve SI. *Engageability* enables PWLD to participate in activities with others. A similar concept was proposed by Schultze and Brooks (2018), who identified joint activity as a crucial factor for experiencing social presence in VWs. The affordance lens reveals the "why" (the action possibility of self-actualization) of the "what" (joint activity).

Self-actualizability enables PWLD to realize their own potential and consequently give back to society. This affordance is similar to "volunteerability," as identified by Thapa and Sein (2018) in the Nepal Telemedicine case, where doctors in city hospitals provided free consulting services to health workers in remote villages of Nepal to give back to society.

In line with current literature, we found that facilitating conditions play a vital role in the actualization process, not only in actualizing but also in perceiving affordances, especially in the PWLD context. Previous research has shown that the affordance of a digital artifact is not readily perceptible. In their study of the use (or rather the non-use) of secondary data from patient health records by doctors and nurses, Hausvik and Thapa (2017) found that the users had not perceived the affordances of these data but became more inclined to use them when their action possibilities were pointed out.

We make a significant contribution to the understanding of affordances by elaborating the link between facilitating conditions and the perception and actualization of affordances. That the actualization of an affordance (or cluster of affordances) leads to the perception of other affordances is well established in the literature (Pentland et al., 2015). To this discourse, Burton-Jones and Volkoff (2017) introduced the concept of feedback from actualization of one affordance to the perception of another affordance. They did not, however, show how this happens. Our paper reveals the mechanism of the feedback. We found that the outcome of actualizing an affordance acts as a facilitating condition for the actualization of another affordance. As Table 3 shows, the outcome of helping others arose from the actualization of self-actualizability. Simultaneously, help from peers was a facilitating condition for actualizing all the affordances. In the picture that emerges, affordances, their perception and actualization, and their facilitating conditions are linked in an intricate web. We capture this insight in the enhanced trajectory of affordances model shown in Figure 11. Our enhancements of the original model are highlighted in italics.

9 Implications

Before proceeding to the implications for research and practice, we present the limitations of our study, which also indicate avenues for future research.

9.1 Limitations

One can argue that our dataset was limited since the data collection period lasted just one year and there were only 18 participants. However, in this one year, we collected intensive data through interviews and observation. The first author was a participant observer in SL and engaged in extensive interaction with the novice group. Although we observed some differences, we argue that this does not mean the data are invalid (Patton, 2002). Consistency in the patterns of data and reasonable explanations for the differences in data from various sources add to the overall credibility of the findings (Patton, 2002). The varying reports from participants indicate multiple experiences of similar situations; this helped us to build the line of reasoning presented in the paper.

While all participants came within the definition of PWLD, they represented six different disabilities. Our aim was not to explore affordances for people with a specific disability but to understand how PWLD experience the use of VWs. Focusing on specific disability groups would be an interesting avenue for future research.
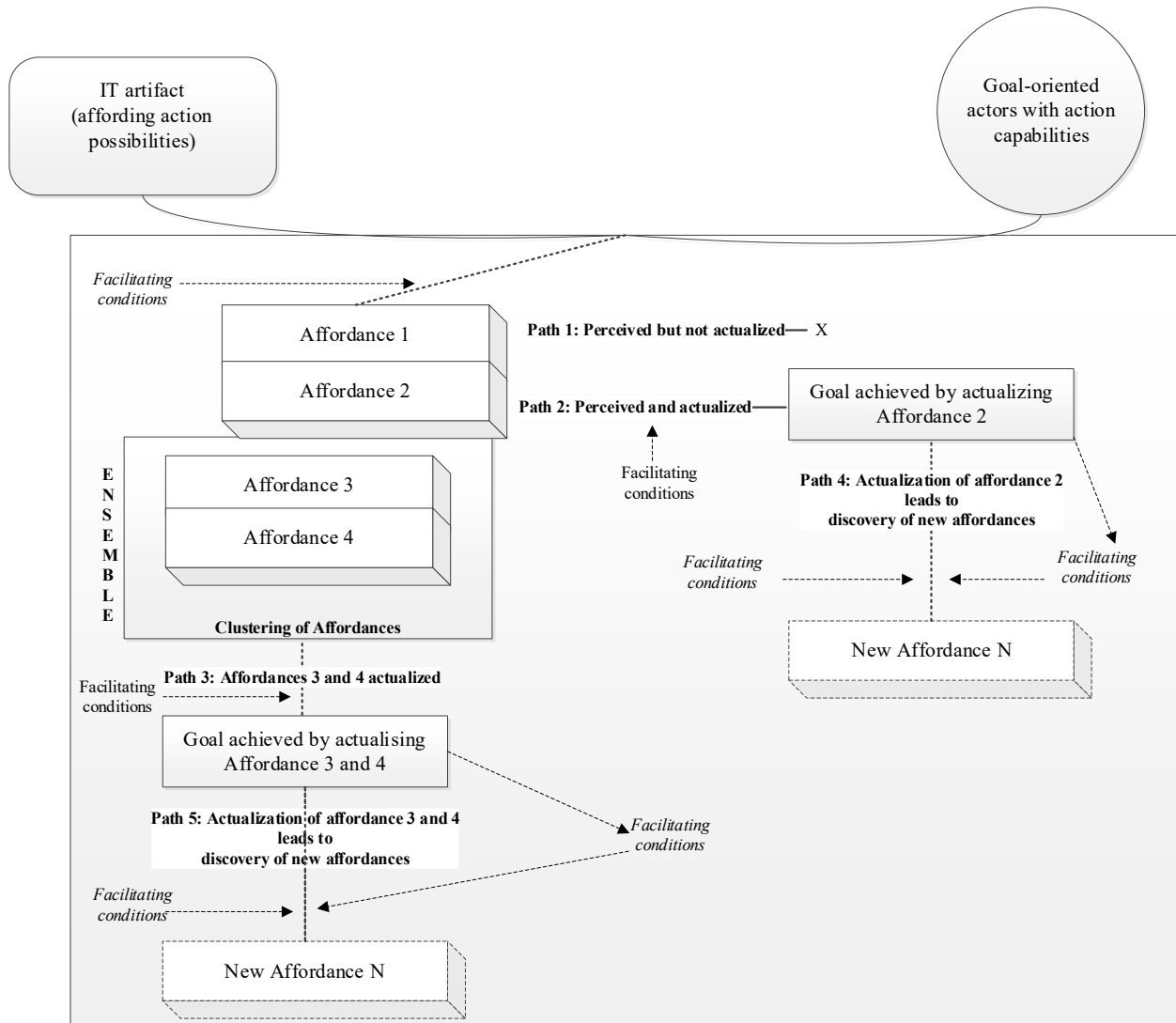
Figure 11. Enhanced Trajectory of Affordances Model Adapted From Thapa and Sein (2018)

In response to the reasonable criticism that we have studied an old VW technology, SL, we argue that while some specifics—e.g., technological constraints—may no longer be relevant in newer versions of VWs, such as Oculus' Virtual Reality, this does not fundamentally change our findings, since the concept of affordances applies no matter which generation of technology we are studying. To set the perspective, when VWs are compared to other online media (e.g., Facebook and forums), the VWs offer a representation of self, including a relationship between the physical and the virtual self (Schultze & Leahy, 2009). The next generation of technology, such as the metaverse, takes this interaction between the system and the user—and between users—to a new level. However, representation of the self in the metaverse may be more powerful than what is familiar from traditional VWs (Park & Kim, 2023). Avatars in the metaverse are more intricately linked to the physical self due to the metaverse's proximity to the physical world (Park &

Kim, 2023). This would be an interesting avenue for future research to explore.

The context of our study was specific: PWLD and SI. The five affordances we identified are not generic, i.e., they are not necessarily relevant to all users. Most are relevant only to the context of PWLD and SI. Furthermore, such theorization can provide contextual explanations and reveal the contextual factors and the process by which certain phenomena occur (Avgerou, 2017). As we have shown in our analysis, the identified VW affordances arise in a specific socio-cultural-historical context.

9.2 Implications for Research

Earlier in the paper, we presented the debate on affordances-as-perceived vs. affordances-as-actualized. In Section 2, we suggested how these two views can be reconciled. Our view is that both arguments have merit, but they look at two stages of affordance.

We classified affordances into functional and social types. We found evidence that while there is a sequential relationship between them, it is not unidirectional. The actualization of functional affordances is necessary to perceive and actualize social affordances; however, the reverse also happens. The circumstances and nature of this bidirectionality represent an interesting area for future research.

There have been other classifications of affordances based on different criteria. Valbø (2024) proposed a multilevel classification: micro-, meso-, and macrolevels. These levels can be mapped onto individual, group, and societal levels in the ecology model proposed by Simplican et al. (2015). Our two social affordances, *engageability* and *self-actualizability*, can be classified as being at the meso- and macrolevels in Valbo's hierarchy. Earlier, we cited Gibson (1979), who mentioned "ambient light" (i.e., the environment in which affordances arise). He emphasized that humans are an integral part of the environment and that social interactions and engagement are therefore essential for actualizing complex social affordances. This supports our reasoning that an affordance such as *self-actualizability* is a social affordance because it is manifested only through interaction with other humans. The question of whether there is an ontological difference between affordance types is an intriguing philosophical issue for future research.

Our focus on SI for PWLD provides a new perspective on affordances. Traditional research has primarily examined how technology impacts individuals without disabilities (Malik et al., 2024), often leading to limited assumptions about the abilities required to utilize the affordances offered by technology. Our findings shift the focus to a group of users who ironically need the most attention. For a user without a disability, the action possibilities of a technology make the individual or organization efficient, effective, and innovative. These are desirable goals, but the user will survive without them. For PWLD, however, technology can offer possibilities that are lifesaving. In our study, all participants strove to be "seen as normal" and to "feel normal." We argue that this makes our study, at the very least, axiologically relevant. In this respect, we answer the call for research that avoids stereotypes and assumptions about individuals using and interacting with technology (Trauth, 2017).

Our study has highlighted the importance of assistive technology for PWLD when they are using VWs. There is a need to examine the compatibility between such technology and VWs. Some properties of VWs can, however, actually serve to reconstruct or even magnify disability (Carr, 2010). For example, introducing a voice feature to SL created the risk that deaf students would be excluded. A longitudinal study would be useful to explore how PWLD overcome initial challenges and become confident in using the properties of VWs. While facilitating conditions are vital for perceiving and actualizing affordances, their importance may change over time. The possible differential role of facilitating conditions over time would be a useful avenue for future research. Many of the physical challenges faced by PWLD are related to interacting with a VW. For people who are unable to type, a keyboard and a mouse are useless. While a thorough discussion of design issues is beyond the scope of this paper, we refer the reader to the human-computer interaction design literature for a detailed discussion (Vimalan et al., 2024).

Our findings indicate that through VWs, PWLD were able to overcome loneliness, experience a greater degree of SI, and exert control over their own lives. However, we do not know whether this carried over into their physical world or whether it was confined to the VW. There are a few studies that propose that activities carried out in cyberspace may create opportunities for people with intellectual and developmental disabilities to gain a sense of belonging, a group identity, and confidence that is transferable to the physical world (Hall, 2009; Standen & Brown, 2006; Stewart et al., 2010). Since we do not have the data, this is only a conjecture. Moreover, Standen and Brown (2006) indicate that, while social skills learned in the virtual world are transferable to the physical world for most PWLD, this is not necessarily the case for people with autism spectrum disorder (ASD), who often have trouble reading social cues in the physical world, which makes social interaction difficult. A longitudinal study is needed to examine the overall effects that VWs may have on PWLD and their SI in the physical world.

Our narrative has interpreted the data through the sensemaking lens of affordances. We readily concede that other sensemaking lenses may be equally plausible. One such alternative lens is how PWLD gain psychosocial benefits from SL.[2] This alternate way of sensemaking is an inherent characteristic of the interpretive paradigm of the research and is worth exploring.

9.3 Implications for Practice

Our findings can help practitioners, government agencies, and healthcare professionals understand the opportunities that VWs offer to PWLD. Our pathway model can provide important insights into how to develop programs to help PWLD move toward SI. Our participants were able to actualize the identified affordances only because the necessary facilitating conditions were present. There are three ways to actualize an affordance to reach a desired goal: (1) increase the user's capabilities, (2) change and enhance the technology's properties, and (3) improve the facilitating conditions.

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[2] We are indebted to an anonymous reviewer for this insight.

In terms of (1), the capabilities of PWLD are a constraint and a part of the context. In terms of (2), our study starkly exposed the technological challenges that VWs pose for PWLD. The findings have implications for VW design, which we discussed in the previous section. The SI lens can inform design by explicitly incorporating a VW's action possibilities. For example, specific areas can be designed to enhance IR and CP. By framing VW as an ensemble, facilitating conditions that are needed to perceive and actualize the affordances can be designed into the artifact. Alternatively, the facilitating conditions could be explicitly stated as part of the installation and implementation of the technology, possibly through user manuals. Our *affordance-based pathway model of social inclusion* further adds to this discourse by providing pointers for design, especially the design of recent technologies such as the metaverse. A metaverse must provide an environment for culture and interaction similar to that in the physical world (Park & Kim, 2023). Developers of metaverses may find our findings useful for ensuring SI for all.

Enhancing the functionality of technology is possible. In the short run, however, it is not a feasible alternative. That leaves us with alternative (3): enhancing the facilitating conditions. This is feasible both in the short and the long term and can be implemented in multiple layers of the ecological model. Many of our participants gradually learned to use SL more effectively, which suggests training as a facilitating condition (in the organizational and sociopolitical layers). Some users were helped by other users, which points to the effectiveness of social networks (in the interpersonal layer). A good example is the use of intermediaries, such as "evangelicals" in Italy (Spagnoletti et al., 2015), as an effective way of helping users who are new or uncomfortable users of technology. The implication is that practitioners should be prepared to assist, guide, and support PWLD in acquiring a level of confidence that enables them to utilize VWs without continued assistance.

10 Conclusion

In its *World Report on Disability*, the World Health Organization makes several recommendations related to actions needed to improve SI for people with a disability. This report encourages researchers to conduct research on the lives of persons with a disability and urges the private sector to "ensure that information and communication technology products, systems, and services are accessible to persons with disabilities" (World Health Organization, 2011, p. 22). The outcome, the report hopes, would enable the public and private sectors to develop and provide effective services for the disabled. With this study, we take a step towards heeding the World Health Organization's call by focusing on PWLD and making ICT integral to the study.

In this paper, we have attempted to tell the story of a marginalized group, PWLD, whose members are isolated because of their disabilities. The individuals belonging to this group wish to be included in society and to form interpersonal relationships so that they can participate in community activities. They wish to be seen as equals. Their path from a state of isolation to a state of inclusion is arduous and challenging. To travel along this path, they have ICT, which provides them with action possibilities that can support their journey. However, conditions must be in place that facilitate acting on these possibilities. Some of these conditions must be at the interpersonal level, others in the organizations to which they belong, and yet others in the communities in which they live, and all of them must be supported and enabled by the government and society as a whole. With these conditions in place and technology at hand, isolated PWLD can patiently and slowly but surely travel along the path and eventually reach the goals of SI, forming interpersonal relationships and participating in community activities so that they are no longer isolated and can finally *feel like normal people*.

Our study highlights the myriad challenges that PWLD face when using ICT. Nevertheless, with help and sheer perseverance, our participants overcame many of these challenges. This drives home a vital point. PWLD do not require our pity or condescension: They require help to discover the action possibilities of technology that will put them on the path to SI.

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Appendix A: Locations and Activities

Location	Activities
Arcachon	Boating, water scooter, hot air balloon ride, lying on the beach, and building a sandcastle
Black Horse Saloon	Dance
CCC-Mini Golf	Miniature golf
Chamonix City	Ice skating, skiing, sledding, and ice hockey
Chelsea's Diner	Bowling and arcade
Cherokee Historic Park	Horseback riding
Christmas Wonderland	Sleigh ride and shopping
Freebee store	Shopping
Funfair Dreams	Bumper cars, carousels, roller coasters, maze, and Ferris wheel
Grand Canyon	Horseback riding, hiking, and boating
Great Wall of China	Walking the wall
Kamimo Island	Football/soccer, dancing, diving board
Muddy's Music Café	Dance
Native American Park	Horseback riding
Ohana Rock Club	Dancing
Parktown Zoo	Zoo
Prim Hearts Amusement Park	Roller coasters, monorail, freefall tower, go-carts, Ferris wheel, water slides, carousels, and haunted house
Second Norway	Water scooter, dance, hot air balloon
SL Surfing association	Surfing and lying on the beach
The Loose Moose Lodge	Dance
The Lunatorium	Underwater dancing
Virtual Ability Island	Playground, shopping, and sailing
Virtual Africa	Watching wild animals and boating

Appendix B: Plan of Sessions in Second Life

Phase	Activities
Meeting phase	- Meet in Kamimo Island. - Greeting the participants as they enter SL. - Hi, how are you? - Have you been in SL since we were here last? - What did you do when you were here? - Talk about activities they want to engage in. - What do you want to do today? - If no specific activity is chosen, I suggest two activities for your choice. - If the activity is chosen, I provide teleport to the location of the activity. - Prepare teleport. - I provide teleport/inform which teleport already provided. - Participants teleport first.
Main phase/activities	**Scenarios in the main phase to be repeated as needed** - Meet at location after teleporting. - Participants get to look around and explore the location. - Find activity: - If new activity, I show or tell participants how to do the activity. - If participants encounter a problem, I help them to do the activity. - When and if participants do not want to stay at location or with the activity: - Ask what they would like to do next. - If no suggestions, suggest two new activities for choice. - In all scenarios: - Ask if this is difficult or easy. What specifically? - How do you feel about this activity? - Did you like it here? - What do you like about this location? - If meeting others, - How did you like meeting those people? - How did you like talking with them? - Toward the end of main session, provide teleport or inform to teleport back to Kamimo Island.
Closing phase	- Meet back at Kamimo Island. - Did you enjoy this session? - What did you like or dislike the most? - What activity would you like to do again? - What would you not like to do again? - Prepare for next meeting: - Next meeting will be in "number of weeks." - Thank you for an enjoyable time, see you next time.

About the Authors

Karen Stendal is a professor of information systems at the University of South-Eastern Norway. She holds a PhD in information systems from the University of Agder, Norway. Her broader research interests focus on social inclusion through technology, eHealth, extended reality, and virtual teams. She has presented at international conferences such as IFIP WG 8.2, the European Conference on Information Systems, the Americas Conference on Information Systems, and the Hawaii International Conference on System Sciences. Her research has been published in leading academic journals such as the *Journal of Medical Internet Research* and *BMC Health Services Research*. Her academic memberships include AIS and SIG SI.

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