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Temporal Progression of Four Older Adults through Technology Acceptance Phases for a Mobile Telepresence Robot in Domestic Environments

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Abstract: Loneliness is increasingly common, especially among older adults. Technology like mobile telepresence robots can help people feel less lonely. However, such technology has challenges, and even if people use it in the short term, they may not accept it in the long term. Prior work shows that it can take up to six months for people to fully accept technology. This study focuses on exploring the nuances and fluidity of acceptance phases. This paper reports a case study of four older adult participants living with a mobile telepresence robot for seven months. In monthly interviews, we explore their progress through the acceptance phases. Results reveal the complexity and fluidity of the acceptance phases. We discuss what this means for technology acceptance. In this paper, we also make coding guidelines for interviews on acceptance phases more concrete. We take early steps in moving toward a more standard interview and coding method to improve our understanding of acceptance phases and how to help potential users progress through them.

Keywords: longitudinal study; acceptance phases; telepresence; older adults; case study



Citation: Baggett, R.; Simecek, M.; Tsui, K.M.; Fraune, M.R. Temporal Progression of Four Older Adults through Technology Acceptance Phases for a Mobile Telepresence Robot in Domestic Environments. *Robotics* **2024**, *13*, 95. <https://doi.org/10.3390/robotics13070095>

Academic Editors: Martin Cooney, Mariacarla Staffa and Filippo Cavallo

Received: 20 May 2024

Revised: 13 June 2024

Accepted: 15 June 2024

Published: 22 June 2024



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1. Introduction

Many people, especially home-bound older adults [1], feel lonely, which can lead to increased illness and mortality [2], and decreased quality of life [3]. Loneliness can come from not only social loneliness (i.e., loneliness from not having people around) but also emotional loneliness (i.e., loneliness from lacking a reliable partner [4,5]).

However, technology is increasingly supporting people to socially connect at a distance [6]. The more elements of social presence the technology evokes (e.g., simultaneous voice, video, ability to move around the room), the more effective it can be at increasing social connection, but see here for conflicting ideas [7]. Similar research has been conducted surrounding older adults' loneliness and the impact artificial companion robots can provide [8,9]. Similarly, mobile telepresence robots are especially helpful for people, invoking a deeper sense of interaction and improving health and social connection [4,5,10,11].

However, for these robots to be most useful, people must accept and use them over the long term. Many robots go through disuse as early as the first month [12]. Researchers have proposed acceptance phases that users must go through to reach full acceptance of technology, e.g., Expectation, Encounter, Adoption, Adaption, Integration, and Identification [13]. It can take people up to six months to fully accept robotic technology. Prior work tends to present a highly cohesive and unidirectional picture of acceptance phases in which people progress from one phase to the next [13]. However, a closer look shows that people

can move back and forth between acceptance phases. Better understanding the nuance of individuals' progression through acceptance phases can help us support people with different user profiles and those in different beginning phases of acceptance to accept the technology long-term.

In this paper, we present a seven-month qualitative case study of four older adults with mobile telepresence robots—an important, but understudied topic [4,14,15]. We interview the adults monthly as they progress through their acceptance phases [13]. We also include a disuse phase [12,16]. We present a more nuanced perspective on progression through acceptance phases, including when characteristics of other phases occurred within one phase and when phases appeared multiple times throughout the study. This work is important to help researchers and practitioners support users in accepting new technology.

2. Background and Related Work

2.1. Mobile Telepresence Robots

Mobile telepresence robots are robots that allow users to move through a remote environment while engaging in videoconferencing [17]. These robots can help people socially connect with family members and friends who are distant. Because telepresence robots provide more physical and emotional interaction compared to ordinary phone or video calls [14,17,18], they help people decrease feelings of loneliness and depression, and improve health and social connection [4,5,10,11]. This can be especially helpful for older adults who are more likely to feel lonely [19] due to the loss of social relationships, health issues, and mobility difficulties than those in younger populations [14,20,21].

2.2. Challenges of Mobile Telepresence Robots

Although mobile telepresence robots may particularly help older adults, using the technology can be especially challenging for them [22]. Research on the “digital divide” shows that many older adults have less skill and affinity for new technologies than younger adults, which can mitigate that technology's potential benefits for social interaction [23]. Older adults often revert to older technology with which they were more familiar, like telephones (landlines and mobile) or writing letters, rather than social media or video calls [24], especially during times of stress. However, many older adults are willing to learn how to use new technology when it helps them be more independent in their home lives [25].

Some difficulties of robots include technical difficulties of adjusting features and challenges related to poor internet connection [26]. Some older adults prefer phone calls over a telepresence robot for longer conversations due to audibility issues [11,18]. Other hesitations to use telepresence robots relate to privacy. Many older adults do not want a robot to move about in their private residences for fear that a person on the robot (or an unauthorized user attacking the robot) could overhear or see sensitive data (e.g., identification, bank information, and medical history), as well as physical privacy of more intimate spaces and moments [27]. Privacy may also be breached through hacking, theft, and social invasion. It is important to examine how older adults can get the most out of mobile telepresence robots while also feeling secure and protected in their own homes.

2.3. Mobile Telepresence Robots and Older Adults

Research on mobile telepresence robots with older adults is strongly focused on using them for telehealth checkups, in which realm they can give better contact with healthcare providers and improve care and health [28–30]. Telehealth robots also create more opportunities for older adults to socially connect [29,31]. Research on long-term telepresence robot use primarily for social connection is limited. Some studies have examined telepresence robots for social connection in eldercare facilities [14,32]. Residents in eldercare facilities who used the robots felt that the robots helped them connect with their families and decreased feelings of loneliness [11]. Two prior studies examined telepresence robots in homes of independent-living older adults primarily for social connection [14]. In the

first, a 2-day study, older adults received daily calls via the robot from the research team and up to two additional daily calls from a family member or friend trained to use the robot [4]. Having someone check in on them through the robot reduced loneliness and increased the perceived presence of the caller. Moreover, participants reported that the robot was like another person [4]. In the second, a 12-month case study, two participants could use a robot in their homes whenever they liked. Results showed that they had continued use and interest in the robot for social connection [15]. Several other studies concern older adults and their acceptance and use of various advanced technologies similar to our study [33–35]. More research should examine long-term (>6 months) use of robots in older adults' homes because use and acceptance can change over time [13]. In our previous study [36], we placed telepresence robots in older adults' homes for seven months. However, our prior paper focuses on the benefits and drawbacks of the robots and does not examine long-term acceptance.

2.4. Long-Term Technology Acceptance

There are many models of technology acceptance. Many of these models do not include time as a factor. The Technology Acceptance Model (TAM) [37] posits perceived ease of use (i.e., it is easy to use) and perceived usefulness (i.e., it has a purpose) as the two primary factors in determining one's intentions to use technology [37–40].

The more recent Extended Technology Acceptance Model (ETAM) proposes including user characteristics, like computer literacy, technical support, and online learning anxiety [38,41]. The original Unified Theory of Acceptance and Use of Technology (UTAUT) supports impacts of acceptance, including three impacts for intention of use: performance expectancy, effort expectancy, and social influence and facilitated conditions [42]. The information system (IS) and information technology (IT) Acceptance and Use (IS/IT) model extends the UTAUT to include attitude, which is impacted by social influence and directly affects usage [43].

However, to understand how people think and feel about technology, it is important to go beyond the novelty effect and examine acceptance over long-term use. As people experience and learn more about their new technology, they think and behave differently related to it. Longitudinal studies need to be of at least two months to observe use beyond the novelty effect and how people settle into routines with the technology [44]. Studies lasting six or more months allow participants to go through all the acceptance phases and become fully acquainted with and understand the technology [13]. By month six, technology becomes more than an accessory as it becomes a personal object through emotional attachment.

Several models rely on time as a factor of acceptance. Some models more generally describe pre-acceptance (before using the technology), acceptance (early technology use), and post-acceptance (after initial acceptance; e.g., [45,46]). Other models include more detailed descriptions of acceptance. For example, the theory of domestication [47] explains the processes with which users give meaning and significance to the technology. The theory of diffusion of innovations [48] explains how users can reinvent or change technology while using it and the organizational process of structuring how technology and social structures change over time. It focuses on the technology's characteristics and environmental aspects rather than predictions of outcomes compared to other acceptance models [48–50]. The Domestic Robot Ecology (DRE) model [51] includes additional temporal steps of acceptance: Pre-adoption, Adoption, Adaptation, and Use and Retention to distinguish beginning use from understanding the strengths and disadvantages of the technology, and finally settling into a routine with the technology.

In this paper, we follow the phases outlined by de Graaf et al. [13], which combined longitudinal frameworks from prior research [51–53] to create an overarching Phased Framework of long-term robot acceptance. De Graaf's paper, *The Phased Framework for Acceptance of Technology*, includes six phases: Expectation, Encounter, Adoption, Adaptation,

Integration, and Identification [13]. Another phase, Non-Use, indicates when users stopped use after full acceptance was achieved [12].

We followed de Graaf et al.'s Phased Framework [13] because it closely aligned with our research involving mobile telepresence robots over a long-term study. This study [13] followed a timeline for data collection for each phase from previous studies of user acceptance of robots in individual living residential environments [13,51,54,55]. Within our study, we included a seventh phase, Non-Use, which can occur at any time. We describe the phases and approximate timelines below.

Phase 1. Expectation. In the Expectation phase, before encountering the technology, individuals have no personal knowledge or experience interacting with the technology [53]. In this phase, users gather information about the technology or relate it to something they know [16]. They judge the new information and develop attitudes and emotions toward the technology [13].

Phase 2. Encounter. In the Encounter phase, people use the technology for the first time. They reevaluate their past expectations of the technology based on their own experience with it and develop new expectations [13,56]. If their expectations do not match with the actual technology and its utilities, they may not advance to the next phase [57].

Phase 3. Adoption. In the Adoption phase, after the technology is introduced (typically within 2 weeks), people are often excited or frustrated (constituting a positive or negative experience) with the technology [13,16,53]. In the Adoption phase, people still have apprehension and concern as they seek to fully understand the technology, but they are slowly becoming more comfortable.

Phase 4. Adaptation. In the Adaptation phase, approximately one month after the technology introduction, people fully adopt the technology [13]. They can become more comfortable with the technology by learning about it, enhancing its uses, and adapting it to them, or adapting themselves to its current use. They better understand their excitement and frustration and see if the technology fits their lives.

Phase 5. Integration. The Integration phase tends to occur two months after the technology is introduced [53]. Users have become comfortable with the technology and have incorporated it into their daily lives [16]. In this phase, people know enough about the technology to enhance their positive experiences with it and avoid or change frustrating activities. They may use the technology differently than the designers originally intended [47,58].

Phase 6. Identification. The final phase, Identification, typically occurs six months after technology introduction. It is part of their daily routines, and they may self-identify with it in ways that will either connect them to others through a sense of community or separate them [53]. In this phase, individuals may seek reinforcement of their original adoption and possibly even reverse their decision if negative experiences begin occurring [48].

Phase ∅. Non-Use Phase. Non-Use can occur at any point after beginning to use the technology [12,16] if people reject the technology [16,59]. This can occur as lack of use, non-acceptance, or suspension of use. Lack of use means that users are not using the technology to its full capabilities [50]. Non-Acceptance is when people contemplated accepting the technology, but after an undefined period of use, decided to forgo it (e.g., due to knowledge barriers [60]). Suspension of use is when a user fully abandons any use of the technology after experiencing all its capabilities [16].

Although users tend to progress through this framework according to the timeline indicated, the timeline is approximate; not all users reach acceptance phases at the same time and some users can become stuck in a phase or switch to the Non-Use phase [13]. These are identified as deviations [13]. However, there is little information on how this fluidity occurs for different individuals.

2.5. Current Study

In this paper, we examine how participants progress through the acceptance phases. We use data from a prior study [36] in which we placed a mobile telepresence robot into

the homes of four participants (aged 60+) for seven months. Participants interacted with a family member or friend via the robot at least once per month in study sessions, and we encouraged them to use the robots at their convenience throughout the study. In this paper, we examine these data as a case study to examine individualized experiences through the acceptance phases closely. In this paper, we seek to answer new research questions about how fluid the acceptance phases are:

1. How do participants move through acceptance phases over the seven months with a telepresence robot?
2. During an acceptance phase, how much do participants show characteristics of that and other acceptance phases?
3. What influences participants to move through acceptance phases at different speeds, regress, or come to a standstill?

3. Materials and Methods

In this study, we introduced mobile telepresence robots into four participants' homes. The robots belonged to these participants for seven months, and they could use the robots in any way they wished. We chose seven months to observe how people interact with the robots beyond the novelty effect and through all six acceptance phases; prior work shows that after six months, the way people treat robots becomes more stable [13]. Each month, our research team facilitated an activity in which an interaction partner (IP) joined participants via the robot in their homes. After the sessions, we interviewed the participants without the IPs. This case study is part of a larger study [36], which was not conducted with technology acceptance initially in mind. Within the larger study [36], we examine how older adults use and want to use mobile telepresence robots, how these robots affect their social connection, and how they can be improved for older adults' use. In this case study, we applied the Phased Framework of Technology Acceptance [13] to examine our participants' acceptance of the robots over the seven-month study. We gave participants and IPs pseudonyms to protect their anonymity. We chose these four, of the seven original participants from the larger study, for their diverse experiences and knowledge of technology. Kelly and David had high levels of past technology use and experience; Sasha and Jessica had low or no experience.

3.1. Participants

In the United States, we recruited four participants aged 60+ through radio, newspaper, and social media advertisements and word of mouth. Participants each recruited an IP who was an adult (aged 18+) family member or friend and who lived in a different house than the participant. Participants and IPs were required to speak conversational English, have good internet access, commit to seven months of shared activities, and consent to being audio- and video-recorded. David could not find a single IP who could attend every monthly interview and, therefore, switched between two IPs. We paid participants for interviews (\$75 per interview; 10 max) and activities (\$2 per diary entry; 28 max) that they completed.

3.2. Telepresence-Robot (Double)

We used the commercial Double 3 mobile telepresence robot [61]. Double 3 is a 25-pound (11 kg), two-wheeled videoconferencing robot Figure 1 that works through Wi-Fi. Operators could drive the robot by pressing on a place they wanted to go on the screen or using arrow keys. The Double 3 autonomously avoids obstacles to help users navigate the remote environment. It has two 13-megapixel cameras, so operators can see their surroundings. It has six beam-forming microphones to help users to hear across distances and reduce background noise. The Double 3 screen can be raised and lowered, with a sitting height of 47 inches (119 cm) and a standing height of 60 inches (152 cm). To join a call on the robot, the recommended method is to send guests a single-use access code,

which is valid for 24 h. Another method is to provide host access by providing guests the owner's username and password, allowing guests to log in at any time like owners can.



Figure 1. Double 3 telepresence robot in a participant's house.

3.3. Procedure

We toured participants' homes and then brought the mobile telepresence robot into the home. At monthly study sessions, we observed participants and interaction partners (IPs) doing shared activities via the robot. Between sessions, participants could use the robots freely. After seven months, we collected the robots and conducted final interviews.

3.3.1. Before Main Sessions

House Tour. Two weeks before the study, we assessed participants' homes to ensure that the robots could function effectively. This included the requirements of a strong internet connection (i.e., sufficient bandwidth and good Wi-Fi coverage), a floor the robot could drive on (e.g., not cluttered so the robot could move freely), and accessible outlets for charging the robot. We conducted a 30-min interview with participants about their expectations of the robot (see Section 3.4). Then, participants showed us where they intended to place and use the robot.

Bringing Robot. Two weeks later, we brought the robots to participants' homes. All full-time residents attended this session, and IPs joined via the video conferencing tool Zoom. We gave standardized introductions on using the robot. This step was necessary because prior work shows that how a robot is first introduced directly affects how people use it [62], even after months of use [44]. Participants examined the robot's box as if they were buying it at a store; then we helped assemble it. Next, we assisted IPs in switching from Zoom to the robot and learning to use it, its capabilities, and applications for their daily activities. Then IPs switched to Zoom to discuss their first impressions of the robot, and we answered any final questions about the robot or the study. This session lasted one hour.

3.3.2. Main Sessions

Main sessions occurred monthly over seven months for 45–60 min each. Participants and interaction partners (IPs) did a shared activity together via the robot, with a researcher in the home. Then the researcher interviewed participants about their experience in the past month.

Shared Activities. IPs joined via the robot from their own homes for an activity that the pair chose month to month. The activity could be from a list of examples we provided (e.g., conversation, cook, a walk, chores) or one they devised (e.g., book club, decorating for holidays, board games). These activities differed from typical video conferencing in

that the robot could move around a space so users could freely move around the house during the calls [63]. When participants were simply conversing, they sometimes moved between rooms, such as to show each other something, and other times used little or none of the mobility aspect of the robot. These activities lasted 20 min.

Post-Activity Interview. After the shared activity, IPs logged off from the robots and we interviewed participants in person. This interview lasted the rest of the hour.

3.3.3. Final Session

After seven months, researchers removed the robots from participant homes. Researchers conducted a final one-hour interview with participants via Zoom about their experiences throughout the whole study.

3.4. Measures

In this study, we interviewed participants monthly over seven months, in addition to an initial (House Tour) and end (Final) interviews. Participants completed a short weekly online survey about their experience of social connection or loneliness. We did not include the data from these surveys within this case study as they did not relate to the phasing classifications.

Interviews

We audio- and video-recorded semi-structured interviews. The interviewer was in-person, and the note-taker was virtually present and recording via video conferencing (e.g., Zoom). We interviewed participants twice before the main sessions, and each month after the activity. Then participants had a final interview in which we reviewed their overall experience and satisfaction. We modified questions from a prior study [64] to explore the following topics (see Appendix B for the complete list of questions):

- **Use**—“How often do you use the robot on average per day/week?”; “What activities did you use the robot for?”; and “Would you want to keep using the robot if not for the study?”;
- **Social connection well-being**—“What has been your most memorable experience?”; “How did your emotional connection change with those who you used the robot with?”;
- **Advantages and disadvantages of the robot**—“What are some benefits or disadvantages to this robot?” and “How can the robot be improved?”.

We coded each interview following the codes from the Phased Framework [13] to learn how our participants were experiencing acceptance phases with the robot (see Appendix C). We applied these codes to our previously conducted interviews and did not alter or add interview questions to better fit this framework or the understanding of the acceptance of technology. We followed a three-phase thematic coding process: (1) Two researchers read the corrected transcripts without coding, (2) Researchers reviewed the Phased Framework codes [13] from de Graaf et al.’s paper and talked together to clarify the codes for themselves [65,66]. Researchers each coded 41% of the House Tour, 100% of the Bringing Robot, 49% of the Monthly, and 42% of the Final Interview data on their own. While reviewing these codes together, researchers made any revisions necessary to better clarify operational definitions of each code (see Appendix C). (3) Researchers independently re-coded the transcripts [66,67] in totality. Each participant’s interview response was assigned a single code; the inter-rater reliability calculated using Cohen’s kappa [68] was 100%. Due to the original study not being based on understanding user acceptance, some interview questions did not apply to the coding framework, and thus were excluded from calculations.

4. Results

Below we discuss how participants experienced the acceptance phases as discussed in recorded interviews throughout the seven-month study. We defined participants as being in a given phase when that participant’s codes for that phase peaked (reached a high point; see Appendix D for each participant’s phases, including tables and graphs). For example,

in Figure 2, the **Integration₅** phase peaked at Month 6 (Figure 2). If multiple phases had peaked at the same time, we described participants as being in both phases. Below, we refer to phases using bold lettering and the phase number (e.g., **Expectation₁**) and to codes within phase with italics and the phase number (e.g., *Recognize Disadvantages₆*).

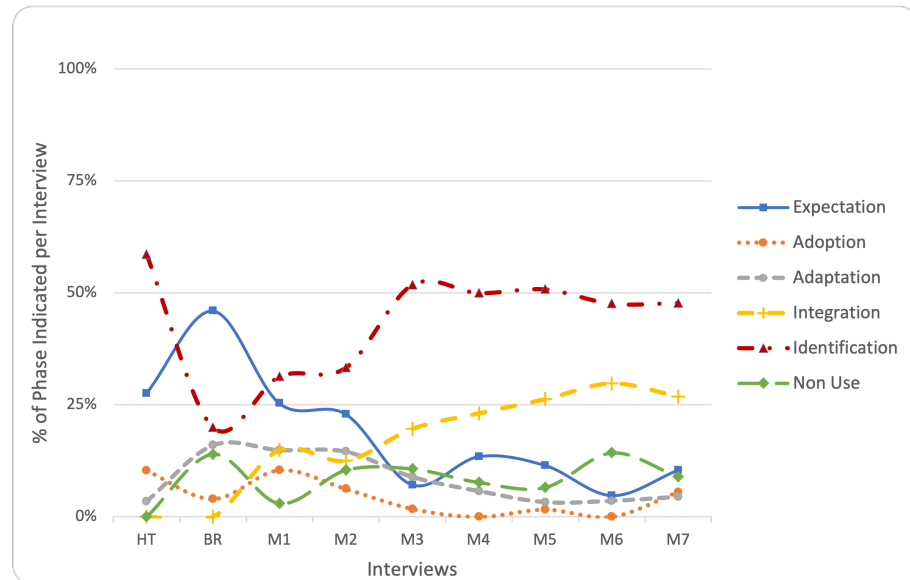


Figure 2. Phase Framework coding totals across all four participants. All percentages add to 100% per interview. See Appendix D for individual participant phase scores.

The reason we chose to recognize peaks rather than simply indicating which phase was discussed most in a given interview was that some topics were more common to discuss throughout the entire study. For example, the **Identification₆** phase became the highest indicated phase for most participants across several months, but during those months other phases had their peaks. If we ignored these peaks, it would seem as though participants did not enter these phases. There are several possible reasons why certain phases appear as most common. First, our interview questions may not have sufficiently encompassed questions about each phase. Second, following the Phased Framework coding scheme [13], the **Identification₆** phase had eight codes whereas all other phases had between one and four codes [13]. This gave **Identification₆** an advantage to be indicated more often due to the likelihood of those eight codes being selected more often than one of the four codes for the **Integration₅** phase. Note that de Graaf et al. [13] had assigned no codes to the **Encounter₁** phase, instead indicating that this phase would always occur during participants' first encounter with the technology. They also had a code that they noted as indicative of both the **Adoption₃** and the **Adaptation₄** phases, and one as indicative of both **Adaptation₄** and **Integration₅**. These codes had very few occurrences, and thus we merged the **Adoption/Adaptation_{3,5}** phase into the **Adaptation₄** phase and the **Adaptation/Integration_{4,5}** phase into the **Integration₅** phase. In doing so, it strengthened the appearances of these phases and better represented the flow of phases, rather than having in-between phases that were underrepresented.

4.1. Phase 1: Expectation

In this phase, participants were not yet introduced to the mobile telepresence robot and had no prior knowledge of which robot they would use. In the **Expectation₁** phase, participants were curious about the uses, applications, controls, and overall purpose of the robot. This phase occurred concurrently across all four participants as follows: during the House Tour (Sasha 85.7%; Kelly 87.5%; David 71.4%; Jessica 85.7%). This phase's characteristics occurred less frequently after the House Tour and were mostly finished by Month 3. Minor occurrences after Month 3 could be due to participants

forming new *Expectations*₁ of the robot because of new *Anticipations*₁ and *Associations*₁ being formed or uncovered, or *Attitudes*₁ being established as participants better understand this new device.

Participants *Associated*₁ the robots with Google Assistant (Sasha), Star Wars, and nonfiction writing about robots (Kelly), and science fiction in general (Jessica). David *Associated*₁ robots with his previous work with a company that incorporated robots into schools in Alaska in the 1980s. Jessica had both high *Expectations*₁, indicating that “robots can do [things] better than I can” (e.g., *Association*₁) and hesitation, considering technology to be “tools, [with] amazing capabilities... but are not always positive...” (e.g., *Attitude Formation*₁). Associations like these affected participants’ *Attitude Formation*₁. Most participants showed characteristics like *Curiosity*₃ and *Excitement*₃ of later phases, but for Jessica, this was the beginning of her *Non-Acceptance*₀ as these attitudes set a negative tone about her prospective robot.

4.2. Phase 2: Encounter

The **Encounter**₂ phase marks users’ first experience and introduction to the technology. The Phased Framework [13] has no codes for the **Encounter**₂ phase but defines it as the first introduction to the new technology. By this framework, all participants experienced this phase during the Bringing Robot session. In this session, they learned to operate mobile telepresence robots and thought of future uses and applications. Participants began expanding on their first *Anticipations*₁ and expectations of the robot. They imagined how it would change their daily lives to add the robot into their home and routines. Participants experienced characteristics of **Expectation**₁, **Adoption**₃, and **Identification**₆ phases in this session.

As participants saw the robots in person, they made more *Associations*₁ with it, like a “tablet on a Segway” (Kelly) or that it was a “rather typical introduction to new technology” (David). This led Sasha, Kelly, and David into further *Anticipation*₁ and *Excitement*₃ about the robot, e.g., there is “a lot that you can do with it” (*Anticipation*₁, Sasha). At this point, some participants (Kelly, David) already began *Recognizing Benefits*₆ and *Disadvantages*₆ of the technology, like possible “issues with the deck” not lining up properly for charging (David) or wishing they “could adjust the [volume] or look down at something” (Kelly).

Jessica had a negative first experience with the robot, which informed her future interactions and set her on a path toward **Non-Use**₀. The robot did not match her expectations based on her prior *Associations*₁ of robots doing things better than humans could. Jessica also believed that she “would have some control over [the robot]... that it would be my [Jessica’s] robot, and it’s not mine” (e.g., *Anticipation*₁, *Attitude Formation*₁). By this, she meant that she had wanted a robot that would be like a smart tablet that could follow her around. She had “hoped that I could put my recipes up and have them right next to me as I cooked” (e.g., *Attitude Formation*₁). She was also dissatisfied with the appearance and function, finding that it “was taking up space and blocking an electric outlet”, causing her to relocate other items to a new outlet (e.g., *Association*₁, *Attitude Formation*₁, *Recognize Disadvantages*₆). Thus, within the first hour of encountering the robot, Jessica “did not see any particular function for it [the robot]” in her life (e.g., *Attitude Formation*₁, *Confirmation*₆).

4.3. Phase 3: Adoption

In the **Adoption**₃ phase, most participants were *Curious*₃ and *Excited*₃ as they began using the mobile telepresence robot and explored its capabilities and limitations. Participants experienced this phase early in the study, during the House Tour (David (28.6%), Jessica (14.3%)) and Bringing Robot (Sasha (18.2%), Kelly (30.0%)). Thus, when they experienced the **Adoption**₃ phase, they also had even higher experiences of the **Expectation**₁ phase, respectively. For example, during the House Tour, David experienced the **Expectation**₁ phase (71.4%) and the **Adoption**₃ phase (28.6%). During the Bringing Robot interview Sasha experienced **Expectation**₁ (54.6%), **Adoption**₃ (18.2%), and **Identification**₆ (27.3%) phases.

All participants were *Excited₃* during this phase. Kelly said, “I am very excited about it, and I knew that Selena_{IP} would be very excited by it as well. It’s going to be a lot of fun to hang out with someone”. They also began *Adjusting₃* to it. After some issues connecting, Sasha said, “I know there are always issues... when you get something new and try to get it to work. But I liked it”. Considering if the robot could complement his social life, David said that he would “just have to see it to know” (e.g., *Curiosity₃*, *Excitement₃*). With his past positive work experiences with robots, David, more than the other participants, sought more information about the robot and embraced positive feelings about its potential (e.g., *Information Seeking₁*).

To a lesser degree than other participants, Jessica entered the phase of **Adoption₃** during her House Tour (14.3%). She was curious about the robot but did not understand “what it does” or “how I would use it” (e.g., *Curiosity₃*).

4.4. Phase 4: Adaptation (Adoption/Adaptation)

In the **Adoption/Adaptation_{3,5}** phase, people typically adapt the technology to themselves and themselves to the technology. However, this mobile telepresence robot did not have significant abilities regarding *Personalization₄*, the only code related to the **Adaptation₄** phase. Interaction partners could only change the height of the tablet for viewers, which they typically did when participants moved between sitting and standing. The inclusion of a single code is likely why we found little evidence of **Adoption/Adaptation_{3,5}**, and thus, we joined it with the **Adaptation₄** phase.

In this phase, participants learned more about the robots through *Trial and Error₄* and *Explored₄* the *Novelty₄* of the robots as well as attempted to *Personalize₄* their robots to their needs. Participants entered the **Adaptation₄** phase in Month 1 (Sasha 21.1%; Kelly 19.1%; Jessica 11.1%) or 2 (David 20.0%). Most participants experienced *Trial and Error₄* with the robot, including “struggling with controls” (Sasha), not having an instruction manual (David), and “issues with the robot moving, not being able to work” (Jessica). Kelly and David especially engaged in *Exploration₄* and “learn[ing] of more possibilities for it” (Kelly). Kelly did not have many technical issues but wanted more time to better understand the operations and possible uses for the robot because it was so new to her. With David’s enthusiasm for learning the technology, he “enjoy[ed] trying the different controls”, like different ways to “free up the target so that the robot could move around”. He added, “I figured out perfectly how to do it”, and explained that he had to be cautious of the different floor elevations and inclusions of rugs throughout his home when attempting to navigate the robot (e.g., *Personalization₄*). In Month 7, Sasha noticed that “... with my son-in-law’s Apple phone, it worked a lot better” (e.g., *Personalization₄*). Sasha and Kelly also discussed aspects of the robot’s motion as *Novelty₄*, with Kelly interpreting it positively (“it’s mobile, whereas with Zoom you just have to sit there...”) and Sasha interpreting it more negatively (it’s “scary when it moves”).

Jessica’s “overall confusion about the robot” (e.g., *Trial and Error₄*) in the first month led her to conclude that she was in a separate ‘condition’ of the study. She believed that the research team purposely “granted her no access to the robot” when they were not present (e.g., *Attitude Formation₁*, *Lack of Use₀*). This was partly due to her lack of understanding of how to use the robot. Despite the research team’s best efforts to help her learn to use the robot, Jessica did not change her mind.

4.5. Phase 5: Integration (Adaptation/Integration)

In the **Adaptation/Integration_{4,5}** phase, participants experimented with the robot to figure out how to *Incorporate_{4,5}* it into their *Routines_{4,5}*. This occurred at very different times for participants in this study, but the occurrences were much smaller in comparison to other phases, as it was for **Integration₅**, which included only one code. Thus, we combined the **Adaptation/Integration_{4,5}** and **Integration₅** phases. In the **Integration₅** phase, users involved the robots in their everyday lives. This phase occurred later in the study, at Months 5 (David 35.7%; Kelly 38.5%) or 6 (Sasha 47.1%; Jessica 14.3%).

By this time, participants had *Incorporated*₅ robots into their typical routines of staying in touch with friends and family (David) or made new *Use Routines*₅ on a weekly or monthly basis (all participants). Users were also more *Familiarized*₅ with the robot and comfortable operating it. Even Jessica in Month 6 discussed enjoying the regular “book club with Victoria_{IP}” during the monthly interview activity, though she showed no signs of *Integration*₅ outside of experimenter-facilitated robot use. Participants considered what they wanted to do with the robot: “I want to find more uses for it. . . I have become more comfortable with it. . . and I want to set up an obstacle course for Selena_{IP} to get more comfortable with navigating it” (Kelly). They also considered things they could not do that would have been helpful. “I wish we could get more people on it, instead of just talking to one person. . .” (Sasha). David had a surprising experience when Michelle_{IP} just “showed up with the robot [on the robot]” when he had not been expecting her (e.g., *Excitement*₃, *Familiarization*₅). This occurrence opened a door to David learning new possibilities of the robot; in this case, he learned that because Michelle_{IP} had his login information for the Double Robotics application, she did not need him to send an invitation to join, she could join whenever she pleased. This sparked a few concerns over privacy as David had not been presentable when Michelle_{IP} joined, but this pair figured out a meeting time frame when visits were acceptable.

Integration₅ of the robots into the routines often included *Reinvention*₅. For example, Sasha and her grandchildren used the robot to “play hide and seek. . . which was a lot of fun. . . because they [the grandchildren] get to drive it around”. Kelly used it to “play board games. . . and teach others how to use it and have some fun”. A *Reinvention*₅ that several participants suggested was for this robot to be like a “doctor system” (David), to “call 911 [to help] elderly people if they fall” (Sasha) or “check in on those who are homebound” (Kelly). Often, these *Routines*₅ and *Reinventions*₅ had started to come into use in earlier months, but they became prominent in Month 5 or 6.

4.6. Phase 6: Identification

In the **Identification**₆ phase, through *Incorporating*₅ the technology into their regular lives over an extended time, participants began identifying it as a personal item. Some developed *Emotional Attachments*₆ with it, including Assigning *Personality*₆, genders, or names to their robot. Participants showed a fuller *Recognition of Benefits*₆ and *Disadvantages*₆ of the technology, strengthened *Confirmations*₆ of previous opinions, and shared their attitudes with others. This can be a form of *Promotion*₆ or sharing negative experiences. For all participants except Jessica, the **Identification**₆ phase was coded most often, likely because it had the most codes associated with it. The phase peaked at Month 3 (Sasha 64.7%; David 76.9%) or Month 4 (Kelly 58.3%) and remained the most frequently coded phase in the following months. David had the highest indicators in this phase (over 70% for several months) and for the others, it approached 50%. For Jessica, the **Identification**₆ phase peaked at Month 5 (55.0%) but was overshadowed by the **Non-Use**₀ phase.

Participants *Recognized Disadvantages*₆ and *Benefits*₆ of the robots. Sasha reported that the robot “cannot go downstairs”, but that the “very lightweight” design allowed her to carry it in their multilevel home. Kelly indicated, “It’s a nice size, and it doesn’t take a lot of room. As an application it’s pretty good”, but “it is not very good outside. . . and it would be nicer if it could dock backward”.

These experiences led to their *Confirmation*₆: “I don’t think I have anything negative [to say] on it”, apart from the disadvantages previously described (Sasha). This led Sasha to *Promote it to Others*₆ and *Maintain Use*₆; she was passionate about “getting a lot of people to know about” the robot, and “invit[ing] more people to use it”. Kelly said it was “nice to hang out with Selena_{IP} and craft or play board games. . . It’s a memorable or awesome thing, being able to set up a board game or cook with a larger group of friends who have not seen her [Selena_{IP}] in a while” (e.g., *Identification*₆).

The month before David’s peak in **Identification**₆, his niece showed up on the robot when he was not expecting her. This caused him to *Recognize Disadvantages*₆ of how “peo-

ple... could turn it on you in situations". He shared his sense that "violence is almost a religion to a lot of people". After another month, he had his peak of **Identification₆**, indicating *Disadvantages₆* of how the robot is "shaky", "can't go outdoors" over rough terrain, and the battery not holding its charge. Although he expressed many *Disadvantages₆*, he firmly believed that "the [robots] potential is certainly there", and that further updates to the design and technology would highly benefit users (e.g., *Recognize Benefits₆*, *Confirmation₆*).

Sasha showed the most *Emotional Attachment₆* to the robot, and she was proud of that attachment. She gendered it and named it "Bob" (e.g., *Emotional Attachment₆*). She explained that "he [the robot] became part of the family... Instead of being a piece of furniture, he became part of the circle... you interact with family through him". She "became attached and... was sad when [the researcher] was taking him [the robot] apart to take him [the robot] away" (e.g., *Personality Attribution₆*, *Emotional Attachment₆*). When asked if she felt an *Emotional Attachment₆* with the robot she stated, "I really did... I was really sad to see him go... I don't know how it developed; it just happened". She added that her husband got "a little jealous" about her connection with the robot and that she "thought it was strange to be able to be so close to... something that's not human... but it feels like it's human". She credited this *Emotional Attachment₆* to the robot "helping build the connection with my daughter" (*Identification₆*).

None of the other participants stated that they felt an emotional connection with the robot as all three expressed at one point or another, "It's just a piece of gear" (David) or that it was a "non-living thing" (Kelly). However, all participants had some *Personality Attributions₆* of the robot, like calling it an "auxiliary member of the household" (Jessica) or assigning the robot a specified gender: "probably find better ways to use him and utilize the robot..." (Sasha).

Jessica entered the **Identification₆** phase during Month 5 (55.0%) when most of her comments revolved around her disappointment with the technology. Jessica felt that "the appearance itself is fine but the application is more limited than I thought it would be; it disconnects a lot; it is not compatible with the landline" (*Recognize Disadvantages₆*). Issues like this brought her to a negative version of *Confirmation₆*: "I would not pay for this". Although she *Recognized Benefits₆* like, "this would be great for welfare checks and telemedicine", they did not outweigh the negative aspects, bringing her to reject the robot and enter the **Non-Use₀** phase.

4.7. Phase $\emptyset$ Non-Use

In the **Non-Use₀** phase, participants stop using the robot after they have been using it. Only Jessica truly entered this phase at Month 3 (83.3%). Other participants had only a couple of codes about this scattered throughout the months.

For Sasha and Kelly, *Lack of Use₀* occurred when they were busy: Sasha "us[ed] it less because I had to work more". They reported positive experiences and that they would enjoy continuing to have this mobile telepresence robot in their homes if given the opportunity. The only time David did not use the robot was in Month 1 because of a battery issue, which we resolved by replacing the robot.

Jessica entered the **Non-Use₀** phase at Month 3. She began showing signs of *Lack of Use₀* after the **Encounter₂** phase (Bringing Robot interview) when she was introduced to the robot. She indicated that she had not used it due to her lack of "access" when the research assistant was not present. She expressed that it did not meet her expectations: "It is not mine... Virginia_{IP} has more control over it than I do, which is a little strange" (e.g., *Anticipation₁*). She said it was "dumber than I [Jessica] had expected", and hoped, suggesting it was just like "making a phone call" (e.g., *Confirmation₆*, *Personality Attribution₆*). During Month 5, Jessica's indications for the **Non-Use₀** phase decreased (20.0%) as her **Identification₆** increased (55.0%), but she continued to express many *Disadvantages₆* of the robot ("it is not easy moving it [robot] around", "the controls are wonky", "it should be more mobile, the software should be easier to use and have more interfaces". Thus, her *Lack of Use₀* quickly turned into *Non-Acceptance₀* during Month 6 when she entered the

Non-Use₀ phase again for her final three interviews. While other phases' characteristics appeared throughout the entirety of her study, Jessica's **Non-Use₀** prevailed until the end. Jessica and her IP continued using the robot at monthly interviews to receive their "payments" (e.g., *Non-Acceptance₀*, *Attitude Formation₁*).

5. Discussion

In this paper, we present a case study in which we placed a mobile telepresence robot in four older adult participants' homes for seven months. We examined individuals' progress through technology acceptance phases as discussed in recorded interviews. The results show how fluid the acceptance phases are and how users vary in how quickly they move through the acceptance phases. Sometimes users experience multiple phases multiple times. Overall, most users did progress through all phases to the final **Identification₆** phase in which they fully accepted the technology. One user experienced **Non-Use₀** and rejected the robot.

5.1. Phases are Fluid

Users can progress, regress, or stall in any acceptance phase based on their experiences with the technology. In any one phase, users nearly always have indicators of multiple other phases. Users seem to experience some phases simultaneously. For example, by our definition, David experienced both the **Expectation₁** and **Adoption₃** phase during the House Tour. During this time, he showed (to a lesser extent) characteristics of all the other phases. De Graaf et al. recognized this fluidity, stating that "these six phases are analytic concepts, not temporal distinctions. with fixed steps in a particular order. Sometimes the proposed sequence holds, but in other occasions, the phases occur simultaneously or are reiterated in feedback" [13]. However, in de Graaf et al. and other longitudinal studies, the results are organized around the timeline and do not show the full fluidity of progress through acceptance phases like our paper does (Table 1).

Table 1. Timeline of phases for case study participants (P). * Denotes when participants did not fully enter the phase.

P	Expectation ₁	Encounter ₂	Adoption ₃	Adaptation ₄	Integration ₅	Identification ₆	Non-Use ₀
Sasha	House Tour	Bringing Robot	Bringing Robot	Month 1	Month 6	Month 3	Final *
Kelly	House Tour	Bringing Robot	Bringing Robot	Month 1	Month 5	Month 4	Month 3 *
David	House Tour	Bringing Robot	House Tour	Month 2	Month 5	Month 3	Month 1 *
Jessica	House Tour	Bringing Robot	House Tour	Month 1	Month 6	Month 5 *	Month 3

Specifically, our data showed evidence for entering the **Adoption₃** phase on the same day that they experienced the **Expectation₁** phase. For some of our participants, this was because when they first considered using it, they experienced *Excitement₃* and *Curiosity₃*—two codes from the **Adoption₃** phase. All participants skipped from **Adaptation₄** to **Identification₆**, with more characteristics of **Integration₅** appearing later (Table 1). Thus, participants had a strong understanding of *Benefits₆* and *Disadvantages₆* of the robot by this time and were already developing *Emotional Attachments₆*, before they talked as much about *Incorporating₅* the robot into their *Routines₅* and *Reinventing₅* purposes for the robot.

Our participants also showed signs of the **Identification₆** phase as early as Month 1 of use. These results are similar to prior work, in which participants reached continued use (analogous to **Identification₆**) after one month of using a new smartphone [53]. Given that our participants' use of the robot continued to evolve over the next five months, this may be true of other technology that people seem to reach continued use of early on; longer-term studies may be necessary to fully understand how users adopt and adapt the technology to their lives.

One participant entered the **Non-Use₀** phase shortly after the robot was introduced into her home. This is similar to other work in which participants can enter **Non-Use₀** at

any point in their experience of acceptance phases [12]. We show how this participant also experienced some characteristics of other phases throughout the seven months, given that she continued using the robot for the duration of the study to be paid.

5.2. Reasons for Fluidity

There are several possible reasons for the fluidity we saw in our paper. It may be related to individual differences of participants or the interview and coding methodology used.

5.2.1. Individual Differences

Progress through the acceptance phases depends on various factors relating to users' preconceived opinions of the technology. In this study, participants who had prior experience with technology or were excited about new technology were more likely to accept it and go through the acceptance phases faster. For example, David had previous job experience with robots, hence his opinion about technology was more likely to lead him to acceptance than Jessica, who was not as familiar with technology and her opinion of technology was more negative. Kelly has had numerous encounters with robots within her home and advanced technology as she is an active member of an online gaming community. Kelly's background and positive experiences with advanced technology set her on a path of acceptance with the mobile telepresence robot. Moreover, while most participants answered "yes", when asked if the robot would complement their social lives, Jessica answered "I have no idea", which already indicated her uninterest in adopting the technology. Throughout the study, Jessica did not feel she had access to using the robot.

5.2.2. Interviews and Coding Method

Some appearances of fluidity may be due to how we ran the study. Researchers should improve and standardize interview questions and coding schemes for acceptance phases. (1) In our study, we used general questions that were not specifically aimed toward eliciting similar amounts of information about each acceptance phase. Future research should develop standardized interview questions that do not bias participants to talk about one versus another acceptance phase. (2) The current coding framework has unequal amounts of codes per phase, which can give an advantage to those occurring more frequently (e.g., the **Identification₆** phase has eight codes, whereas the **Adoption₃** phase has 3 codes; the **Identification₆** phase was coded 6.7 times more than the **Adoption₃** phase through the whole study). Further, some codes are more likely to occur across phases. For example, the **Identification₆** phase has codes like *Recognizes Disadvantages₆* and *Benefits₆*, which were likely to occur throughout users' experience with the technology. Future work should focus on more precisely defining codes to refer to the phases they are intended to exemplify. We have begun this process to improve clarity, and it resulted in a very high inter-rater reliability. We encourage future researchers to use our work (see Appendix C) as a starting point to improve the clarity and standardization of phase codes.

5.3. Study Limitations

One limitation is that in this study, we specifically worked with older adults who lived near the research team so we could travel to their homes for the interviews. This limitation is important because it influenced our entire study and prevented us from recruiting participants with more diverse backgrounds and from various locations. Future research should examine a broader population, based especially on age and location, as this affects technology acceptance. For example, progressing through acceptance phases in a family with young children may look very different as the children affect acceptance.

6. Conclusions

In this seven-month longitudinal study, we examined the incorporation of the Double Robotics 3 mobile telepresence robots into the homes of adults aged 60+. During this time, we interviewed them about their uses and experiences with the robot. Prior studies

have expressed approximate timelines in which participants progress through acceptance phases but do not fully disclose if participants expressed multiple phases at a time or if they bounced between phases without ever fully maintaining a progressive flow [13]. In this paper, we more fully report participant experiences of switching between acceptance phases and experiencing characteristics of multiple acceptance phases at once. We report patterns about what affected participants’ fluidity, such as affinity for technology. We also recognize the need for a more standardized method of exploring acceptance phases, including standardized interview questions and a modified coding scheme. We have begun adding to this endeavor by presenting our changes to the coding scheme that made it more precise. Future work should create a more precise coding framework to better indicate the difference between phases while also making each phase adequately represented.

Author Contributions: Conceptualization, R.B., K.M.T. and M.R.F.; methodology, R.B., K.M.T. and M.R.F.; validation, R.B. and M.S.; formal analysis, R.B. and M.S.; resources, K.M.T. and M.R.F.; writing—original draft preparation, R.B. and M.S.; writing—review and editing, R.B., K.M.T. and M.R.F.; supervision, K.M.T. and M.R.F.; funding acquisition, M.R.F. and K.M.T. All authors have read and agreed to the published version of the manuscript.

Funding: This work was supported by the Toyota Research Institute.

Institutional Review Board Statement: The study was conducted in accordance with the Declaration of Helsinki, and approved by the Institutional Review Board of New Mexico State University (protocol code 22341 and date of approval 17 January 2022).

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The original data presented in the study are openly available in OSF at [DOI <https://doi.org/10.17605/OSF.IO/ARDJQ>] (accessed on 14 June 2024).

Acknowledgments: Thank you to Candace Chambellan and Jennifer M. Rheman.

Conflicts of Interest: KMT receives a small monetary incentive for publication.

Abbreviations

The following abbreviations are used in this manuscript:

- IP Interaction Partner
- PFTA Phase Framework of Technology Acceptance

Appendix A. Participant Tables

Table A1. Participants and demographic information.

Participant #	Participant Pseudonyms	Sex (F or M)	Age	Marital Status	Life Situation	Individuals Living in Home
1	Sasha	F	63	Married	Working	3
2	Kelly	F	70	Married	Retired	2
5	David	M	84	Widower	Retired	1
7	Jessica	F	75	Married	Retired	3

Table A2. Interaction partners and demographic information.

Participant #	Participant Pseudonyms	Sex (F or M)	Age	Marital Status	Life Situation	Individuals Living in Home
1	Chasity	F	39	Married	Stay at home mother	4
2	Selena	F	53	Single	Working	1
5	Patricia, Michelle	F, F	74, 61	Single, Married	Retired, Medical disability	1, 2
7	Victoria	F	74	Divorced	Retired	1

Appendix B. Questions Asked During Interviews

Appendix B.1. House Tour

Appendix B.1.1. House Tour—Technology Use

1. I want you to think about the current technology you primarily use to communicate with a person or group of people. What is it?
2. Tell us why you like it.
3. What's good about it?
4. What is missing in comparison to an in-person visit?

Appendix B.1.2. House Tour—Social Life

1. How would you describe your social life?
2. Do you have many or few friends?
3. How many of these are close friendships?
4. What about family members?
5. What is your marital status?
6. Would you change anything about your social life?
7. Why?
8. How important are friends and family to you for your life satisfaction?
9. How has this changed during your life?
10. How do you keep in contact/interact with them?
11. How do you usually contact people who live far away?
12. Do you think the robot could be a compliment to your social life?
13. Why?
14. How?
15. What kinds of interactions could you see yourself having with the robot?

Appendix B.1.3. House Tour—General Perceptions of Robots

1. How would you describe a robot?
2. What experiences have you had with robots?
3. How have those movies/books affected your perceptions of robots?

Appendix B.1.4. House Tour

1. Can you show me where you would like to keep the robot?
2. Have you thought about where in your house you would like the robot to move around or where you plan on using it most?
3. Do you have any pets?
4. If so, how will you ensure the robot will be secured away from pet access and avoid damages?
5. Do you smoke in your home?

Appendix B.2. Bringing the Robot to the Participants Home

1. How does this first experience with the Mobile Telepresence Robot differ from the expectations you had of the robot?
2. If you had to describe the robot to someone who has never seen or used it, how would you do so?
3. What do you think of this robot?
4. What are the possible benefits of this robot?
5. What are the possible disadvantages of this robot?
6. What are your expectations now for using this robot?
7. How could this robot help you?
8. Would you definitely like to have this robot in your home?
9. Why?
10. Why not?

11. How could you/would you like to use the robot over the next few weeks?
12. Do you feel like you know how you would do that?
13. Or how often you would do it?

Appendix B.3. Monthly Interviews

Appendix B.3.1. Monthly Interviews—Post-Activity Interview

1. Have you used the robot in the last few weeks?
2. How often do you use the robot on average per day/week?
3. What did you use the robot for? What activities?
4. Who did you use the robot with?
5. Do you use the robot differently with different people?
6. If yes, how so?
7. At what times do you usually use the robot?
8. Why have you not used the robot in the last period?
9. Would you want to keep using the robot if not for the study?
10. What do you expect in the coming period of using the robot?
11. Why do you not want to use the robot in the future?
12. When was the last time you used this robot?
13. What were the reasons why you stopped using the robot?
14. Do you plan to use the robot again in the coming period?
15. When do you plan to use the robot again?
16. What do you intend to use the robot for again?
17. What do you expect from using the robot again?
18. Is there anything that could change your mind about it?

Appendix B.3.2. Monthly Interviews—Domestication

1. Do you like using this robot (besides the monthly interviews)?
2. Could you explain what you do enjoy?
3. Could you explain what you do not enjoy?
4. Can you elaborate on any frustrations while using the robot?
5. Have you discovered any new uses for the robot?

Appendix B.3.3. Monthly Interviews—Impression of the Robot

1. What do you think of this mobile telepresence robot?
2. What are the benefits of the robot?
3. What are the disadvantages of the robot?
4. Have your expectations of the robot been met?
5. How can the robot be improved?
6. Have you talked to others about this robot?
7. What did you tell them/what did you talk about?

Appendix B.3.4. Monthly Interviews—Use of the Robot

1. What has been the most memorable event/experience you have had with the robot in the recent period?
2. What has been the most positive experience of your use over the past period?
3. What has been the most negative experience of your use over the past period?
4. Have you experienced any practical or technical problems?
5. Has using this robot helped you learn or operate other technology within your home?

Appendix B.4. Final Interviews Participant

Appendix B.4.1. Final Interview Participant—Intention for Joining the Study

1. Can you tell me what made you want to join this study?
2. What did you hope to get out of it?

3. What did you think it would be like to participate in this study?
4. What did you expect in the beginning?
5. What did you think it would be like to have this robot in your home?

Appendix B.4.2. Final Interview Participant—Intended Usage vs. Actual Usage—Interaction with Remote Person

1. Who did you initially intend to use the robot with?
2. Was this the case throughout or did it change?
3. How did it change? Relates to the next question about others.
4. Did anybody else in your home (including visitors) use the robot?
5. With whom did you mostly use the robot?
6. Do you use the robot differently with different people?
7. How so?
8. How often did you use the robot on average per day/week/month?
9. At what times did you usually use the robot? (morning, afternoon, night, weekend, weeknight)
10. What did you commonly use the robot for? (e.g., talking/or various shared activities)
11. Do you think you are still getting the benefits of feeling more present in telepresence than just using videoconferencing if you're not moving the robot?
12. What is your comfort level of using the robot alone?
13. VS What is your comfort level when the RA is there?
14. How has that experience changed?

Appendix B.4.3. Final Interview Participant—Recalling the Extremes

1. First, what has been the most positive experience you've had?
2. When did that happen? (month, day of week, time of day)
3. Where were you in your home?
4. Who was using the robot (if unclear)?
5. What were you doing?
6. What made this interaction so positive?
7. Next, what would you say has been the most unexpected/creative experience you've had?
8. When did that happen? (month, day of week, time of day)
9. Where were you in your home?
10. Who was using the robot (if unclear)?
11. What were you doing?
12. What made this interaction so unexpected/creative?
13. Now on the other end of the spectrum, what has been the most negative experience you've had?
14. When did that happen? (month, day of week, time of day)
15. Where were you in your home?
16. Who was using the robot (if unclear)?
17. What were you doing?
18. What made this interaction so negative?
19. What did you expect to happen or how would you want this situation to have changed?

Appendix B.4.4. Final Interview Participant—Before and After

1. How did you feel about the robot the first couple of months you had it in your home?
2. How does it compare to the last couple of months?
3. Did the way you used it change over time?
4. How so?
5. Why?
6. When?
7. Did your comfort with using the robot change over time?

8. How so?
9. Can you give an example?
10. Did your frequency of using the robot change over time?
11. If YES—Did the frequency increase or decrease?
12. How has your use of this robot helped you in understanding other technology within your home (if it has)?

Appendix B.4.5. Final Interview Participant—Feedback to the Company

1. On a scale of 1 star to 10 stars, how many stars would you give this robot product overall?
2. Why?
3. What was your first biggest frustration/disadvantage?
4. How frequently did frustration #1 occur?
5. When was the last time (most recently) this happened?
6. On a scale of 1 to 5 (1 = not really frustrating, 5 = extremely frustrating), what level of frustration did you feel?
7. How did you handle frustration #1?
8. What was your second biggest frustration/disadvantage?
9. How frequently did frustration #2 occur?
10. When was the last time (most recently) this happened?
11. On a scale of 1 to 5 (1 = not really frustrating, 5 = extremely frustrating), what level of frustration did you feel?
12. How did you handle frustration #2?
13. What was your third biggest frustration/disadvantage?
14. How frequently did frustration #3 occur?
15. When was the last time (most recently) this happened?
16. On a scale of 1 to 5 (1 = not really frustrating, 5 = extremely frustrating), what level of frustration did you feel?
17. How did you handle frustration #3?
18. How did your frustrations change from the beginning to the end of the study?
19. What was one thing that the company did well/benefits you experienced with the design of this robot? ("Its Appearance?" "Its Use?" "Its Applications?")(Audio, Video quality, Controls, Driving, App, Login process, internet)
20. What was a second thing that the company did well/benefits you experienced with the design of this robot? ("Its Appearance?" "Its Use?" "Its Applications?")(Audio, Video quality, Controls, Driving, App, Login process, internet)
21. What was a third thing that the company did well/benefits you experienced with the design of this robot? ("Its Appearance?" "Its Use?" "Its Applications?")(Audio, Video quality, Controls, Driving, App, Login process, internet)

Appendix B.4.6. Final Interview Participant—Emotional Bond

1. Did you give the robot a name?
2. If so, what did you call the robot?
3. Who named the robot?
4. Is there any significance to this name?
5. Do you feel an emotional connection with the robot?

Appendix B.4.7. Final Interview Participant—Emotional Bond—IF YES

1. What is that like for you?
2. How did you respond to it? (e.g., Were you shocked by it? Were you intrigued? Did you question it?)
3. How did that emotional connection develop or change over time?
4. Did this bond have any special meaning to you?
5. What was that meaning?

6. Did you expect to have an emotional bond with a robot?
7. What helped you form this connection?
8. What happened from the connection? (e.g., did this connection help you in your use/understanding of the robot?)
9. How do you feel now that you will no longer use this robot?

Appendix B.4.8. Final Interview Participant—Emotional Bond—IF NO

1. Do you feel that an emotional connection could ever be formed?
2. Would you want an emotional connection to form?
3. Do you think that you could have formed this connection if given more time?
4. Why?
5. Why not?
6. What do you think barred you from forming a connection?

Appendix B.4.9. Final Interview Participant—Emotional Bond with Others

1. How did your emotional connection change with those who you used the robot with?
2. Was this different from how it might be strengthened when you interact in other ways (e.g., over the phone, in person)?

Appendix B.4.10. Final Interview Participant—Completion of the Study

1. How did participating in the study meet your expectations?
2. Did you get what you hoped to get out of the study when you initially started?
Please elaborate
3. Would you do this study again knowing what you know now?
4. Did having this robot in your home go as you imagined it to?
5. Would you want to use another robot like this in the future?
6. IF YES—Would you continue having this robot in your home given the opportunity outside of the study?
7. IF NO—Why do you not want to use the robot (in the future)?

Appendix B.5. Final Interviews Interaction Partner

Appendix B.5.1. Final Interviews Interaction Partner—Intention for Joining the Study

1. Can you tell me what made you want to join this study?
2. What did you hope to get out of it?
3. What did you think it would be like to participate in this study? What did you expect in the beginning?
4. What did you think it would be like to communicate through this robot?
5. Do you think you are still getting the benefits of feeling more present in telepresence than just using videoconferencing if you're not moving the robot?

Appendix B.5.2. Final Interviews Interaction Partner—Recalling the Extremes

1. First, what has been the most positive experience you've had?
2. When did that happen? (month, day of week, time of day)?
3. Where in the house was the robot?
4. What were you doing?
5. What made this interaction so positive?
6. Next, what would you say has been the most unexpected/creative experience you've had?
7. When did that happen? (month, day of week, time of day)?
8. Where in the house was the robot?
9. What were you doing?
10. What made this interaction so unexpected/creative?

11. Now on the other end of the spectrum, what has been the most negative experience you've had?
12. When did that happen? (month, day of week, time of day)?
13. Where in the house was the robot?
14. What were you doing?
15. What made this interaction so negative?
16. What did you expect to happen or how would you want this situation to have changed?
17. How has your use of this robot helped you in understanding other technology within your home (if it has)?

Appendix B.5.3. Final Interviews Interaction Partner—Before and After

1. How did you feel about the robot the first couple months you were joining through it?
2. How does it compare to the last couple of months?
3. How did your involvement in the activity change over time?
4. Did you feel more/less engaged?
5. Did the way you used it change over time?
6. How so?
7. Why?
8. When?
9. Did your comfort with using the robot change over time?
10. How so?
11. Can you give an example?

Appendix B.5.4. Final Interviews Interaction Partner—Driving the Robot

1. Could you explain your experience in driving the robot?
2. How intuitive or challenging was steering?
3. When did it change?
4. Why/How did it change?
5. How intuitive or challenging was it to get logged into the robot?
6. When did this change?
7. How and why did this change?
8. Did you have any other challenges with the robot?
9. What were they?
10. How did they change over time?
11. Was the mobility aspect of this robot useful to you? (As compared to using a stationary device like a phone/video call)
12. Have you visited the primary participants' homes in person before this study?
13. What is your comfort level of using the robot alone?
14. VS What is your comfort level when the RA is there?
15. How has that experience changed?
16. Did you feel the freedom to explore with the robot?

Appendix B.5.5. Final Interviews Interaction Partner—Feedback to the Company

1. On a scale of 1 star to 10 stars, how many stars would you give this robot product overall?
2. Why?
3. What was your first biggest frustration/disadvantage?
4. How frequently did frustration #1 occur?
5. When was the last time (most recently) this happened?
6. On a scale of 1 to 5 (1 = not really frustrating, 5 = extremely frustrating), what level of frustration did you feel?
7. How did you handle frustration #1?
8. What was your second biggest frustration/disadvantage?
9. How frequently did frustration #2 occur?

10. When was the last time (most recently) this happened?
11. On a scale of 1 to 5 (1 = not really frustrating, 5 = extremely frustrating), what level of frustration did you feel?
12. How did you handle frustration #2?
13. What was your third biggest frustration/disadvantage?
14. How frequently did frustration #3 occur?
15. When was the last time (most recently) this happened?
16. On a scale of 1 to 5 (1 = not really frustrating, 5 = extremely frustrating), what level of frustration did you feel?
17. How did you handle frustration #3?
18. How did your frustrations change from the beginning to the end of the study?
19. What was one thing that the company did well/benefits you experienced with the design of this robot? ("Its Appearance?" "Its Use?" "It's Applications?")(Audio, Video quality, Controls, Driving, App, Login process, internet).
20. What was the second thing that the company did well/benefits you experienced with the design of this robot? ("Its Appearance?" "Its Use?" "It's Applications?")(Audio, Video quality, Controls, Driving, App, Login process, internet).
21. What was the third thing that the company did well/benefits you experienced with the design of this robot? ("Its Appearance?" "Its Use?" "It's Applications?")(Audio, Video quality, Controls, Driving, App, Login process, internet).

Appendix B.5.6. Final Interviews Interaction Partner—Emotional Bond

1. Did you give the robot a name?
2. What did you call the robot?
3. Who named the robot?
4. Is there any significance to this name?
5. Did you form a bond with the robot even though it wasn't in your home?

Appendix B.5.7. Final Interviews Interaction Partner—Emotional Bond—IF YES

1. What was that like?
2. How did you respond to it? (e.g., Were you shocked by it? Were you intrigued? Did you question it?)
3. How did this develop over time?
4. Have you considered what this means to you?
5. What was that meaning?
6. How do you feel now that you will no longer use this robot?

Appendix B.5.8. Final Interviews Interaction Partner—Emotional Bond—IF NO

1. Would you want an emotional connection to form?
2. Do you feel that an emotional connection could ever be formed?
3. Why?
4. Why not?
5. Do you think that you could have formed this connection if given more time?
6. What do you think barred you from forming a connection?

Appendix B.5.9. Final Interviews Interaction Partner—Emotional Bond with Others

1. How did your emotional connection change with those who you used the robot with?
2. Was this different from how it might be strengthened when you interact in other ways (e.g., over the phone, in person)?

Appendix B.5.10. Final Interviews Interaction Partner—Completion of the Study

1. How did participating in the study meet your expectations?

2. Did you get what you hoped to get out of the study when you initially started? Please elaborate.
3. Would you do this study again knowing what you know now?
4. Would you want to use another robot like this in the future?
5. IF YES—Would you continue using this robot given the opportunity outside of the study?
6. IF NO—Why do you not want to use the robot (in the future)?
7. If given the opportunity, knowing what you know from your position as the secondary participant, would you like to have this type of robot in your home in the future?

Appendix C. Coding Scheme

Table A3. Codes for phases and descriptions sorted alphabetically [13]. * indicates a code was altered from the Phased Framework [13] and **bold text** indicates what we altered.

Phase #	Experience	Description	Example
3.	Adjustment	User is adapting to the robot and how to use it.	"Actually, Victoria _{IP} and I are having fun getting to know each other better".
1.	Anticipation *	User expresses expectations about the robot or its use (anticipates benefits or disadvantages that they have not yet experienced).	"I thought I would have some control over it. I thought it would be my robot, and that is not mine. Actually, Victoria _{IP} has more control over it than I do, which is a little strange".
1.	Association	User compares the robot or its use with something else.	"I enjoy talking with Chasity _{IP} , it's like we are in person".
1.	Attitude Formation *	User forms an opinion about the robot or its use. Occurs anytime a new attitude is formed or changed.	"No, no, I cannot use it. There is a design issue [with the robot]".
6.	Confirmation *	User seeks confirmations for or validates their opinion about the robot or its use. (like confirmation bias). Shows no sign of change of opinion since the previous interview.	"You know, it's different. You feel like you're dabbling in tech. It is a nice way to interact with someone as you can see".
3.	Curiosity	User is curious about what the robot has to offer.	"Actively looking for new ways to use the robot".
1.	Discuss with Others	Users have shared their experiences with the robot with others.	"I talked with my whole family at a family reunion".
6.	Emotional Attachment	User is emotionally attached to the robot.	"I do miss him [the robot]".
3.	Excitement	User is emotionally attached to the robot.	"I really enjoy working with the robot".
4.	Exploration *	User is exploring how the robot works, trying things for the first time. Differs from familiarization as the user is attempting to explore the technology's possible uses and understand operation.	"I've been enjoying trying the different controls and there are certain ways you can free up the target so that it [robot] floats around and the robot sort of has a continuous tour. I haven't quite figured out perfectly how to do it".
5.	Familiarization	User is getting familiar and more comfortable with how the robot works and is used to what the robot has to offer as well as the limitations.	"I have become more comfortable with it".
6.	Identification	User identifies themselves with the robot or its use.	"I think the whole purpose of the program is that thing that was started years ago and where they were trying to figure out. What to do about it. People who were elderly and didn't have any local connections".

Phase #	Experience	Description	Example
5.	Incorporation *	User has incorporated (the use of) the robot into his/her existing daily activities/routines; there is no new routine established because of the technology.	"About 2 times a week for chit-chatting and visiting with friends".

Table A4. Continued (2/3): Codes for phases and descriptions sorted alphabetically [13]. * indicates a code was altered from the Phased Framework [13] and **bold text** indicates what we altered.

Phase #	Experience	Description	Example
1.	Information Seeking	User is seeking information about the robot or its use.	"If they came up with a model or version where they can handle different surfaces. I know why they did this, it has a narrow profile, and it can get in between chairs and tables and such. It's narrow. They just have to figure out the market for it".
∅.	Lack of Use *	User is not using the robot to its full mobility and communication capabilities. Occurs before Non-Acceptance.	"Because I have no access to it. And if you give me something to do with it. I might do it, but other than that, it's just taking up my space".
6.	Maintenance *	User is maintaining the way they are using the robot. Consistency in types of activities and the way they use the technology.	"Well, not daily but I'd say a couple of times".
∅.	Non-Acceptance *	User contemplated accepting the robot, but after a period of use decided to abandon it. Becomes non-acceptance after 2 consecutive interviews or lack of use.	"None [use of the robot in the last period], just connecting it to its charger".
6.	Novelty *	User perceives the robot as something new.	"Yes. Oh, I like that it's mobile, whereas with Zoom you know you have to sit there, I have to sit here when I go over there I'm out of the picture you probably can't hear me if I'm way over their fault with the road like you can follow me around or I could follow you around".
6.	Personality Attribution	User ascribes the robot with human-like characteristics, such as personality, emotions, intentions, and needs.	"It's [robot] going to spoil me. . . it's a nice luxury".
4.	Personalization	User customizes the robot and its settings to his/her personal needs.	"Well yeah you know I've been enjoying trying the different controls and you know there are certain ways you can free up the target so that it kind of floats around and the robot sort of has a continuous tour you know. I haven't quite figured out how to do it perfectly. It seems like you set the target and it looks like it's a little elevated over the floor and then when it's in that configuration the target and the robot get it to move around together. You know, it makes it a truly autonomous prize".
1.	Preparation	User is preparing him/herself for the robot that is about to be delivered.	"It needs to be near the outlet. The hallway would be better than the kitchen".

Table A4. Cont.

Phase #	Experience	Description	Example
6.	Promotion to Others *	User is recommending the robot to other people. Different from simply discussing it with others.	"Well, this niece I have on the east coast she's a real organizer involved in a lot of British intakes, and we've talked about her looking into you know she lives in North Carolina and of course, it's a very backwoods state with many respects but they do have the university technology loop and stuff in North Carolina".
6.	Recognize Benefits	User acknowledges the benefits the robot has to offer.	"The screen is big enough, you know, to have good-sized screens".
6.	Recognize Disadvantages	User acknowledges the disadvantages the robot has to offer.	"Sort of make it easier for, like older people to use it, you know, more accessible".
5.	Reinvention	User is inventing new applications/utilization's for the robot.	"Oh, playing the board game. Figuring out all the stuff I could do or, you know, figuring out how to do this, connect to the TV or use the webcam".
Ø.	Suspension of Use	User fully abandons any use of the robot after fully experiencing it.	-
4.	Trial and Error	User is trying how the robot works and encounters some frustrations.	"There's kind of a limit to what you can do if you can't go for a walk. Like if you go for a walk, you could walk around the neighborhood and then try to run back and check your room because it's much easier".
5.	Use Routines *	User has acquired a routine of using the robot. Occurs when users create a new routine because of the new technology (i.e., calling X because of the robot).	"Chit chatting and visiting with friends".

Table A5. Continued (3/3): Codes for phases and descriptions sorted alphabetically [13]. * indicates a code was altered from the Phased Framework [13] and **bold text** indicates what we altered.

Phase #	Experience	Description	Example
1.	Preparation	User is preparing him/herself for the robot that is about to be delivered.	"It needs to be near the outlet. The hallway would be better than the kitchen".
6.	Promotion to Others *	User is recommending the robot to other people. Different from simply discussing it with others.	"Well, this niece I have on the east coast she's a real organizer involved in a lot of British intake, and we've talked about her looking into you know she lives in North Carolina and of course, it's a very backwoods state with many respects but they do have the university technology loop and stuff in North Carolina".
6.	Recognize Benefits	User acknowledges the benefits the robot has to offer.	"The screen is big enough, you know, to have good-sized screens".
6.	Recognize Disadvantages	User acknowledges the disadvantages the robot has to offer.	"Sort of make it easier for, like older people to use it, you know, more accessible".

Table A5. Cont.

Phase #	Experience	Description	Example
5.	Reinvention	User is inventing new applications/utilization's for the robot.	"Oh, playing the board game. Figuring out all the stuff I could do or, you know, figuring out how to do this, connect to the TV or use the webcam".
Ø.	Suspension of Use	User fully abandons any use of the robot after fully experiencing it.	-
4.	Trial and Error	User is trying how the robot works and encounters some frustrations.	"There's kind of a limit to what you can do if you can't go for a walk. Like if you go for a walk, you could walk around the neighborhood and then try to run back and check your room because it's much easier".
5.	Use Routines *	User has acquired a routine of using the robot. Occurs when users create a new routine because of the new technology (i.e., calling X because of the robot).	"Chit chatting and visiting with friends".

Appendix D. Participant Coding Tables

Below we include coding tables from each participant, tallying how many times each code occurred in each interview. We also include the information graphically below.

Table A6. Participant 1 Coding—Sasha. HT—House Tour; BR—Bringing Robot; M—Month.

Experience	HT	BR	M1	M2	M3	M4	M5	M6	M7
Phase 1: Expectation Phase									
Anticipation	1	4	1	0	0	0	0	0	0
Association	1	0	2	3	0	1	1	0	0
Attitude Formation	1	4	1	0	0	0	0	0	0
Discuss with Others	0	0	2	2	1	1	0	1	2
Information Seeking	0	1	0	0	0	0	0	0	0
Preparation	2	0	0	0	0	0	0	0	0
Totals	6	6	6	5	1	2	1	1	2
Phase 2: Encounter Phase									
Phase 3: Adoption Phase									
Adjustment	0	1	2	1	0	0	0	0	0
Curiosity	0	0	0	0	0	0	0	0	0
Excitement	0	1	0	0	0	0	0	0	1
Totals	0	2	2	1	0	0	0	0	1
Phase 4: Adaptation Phase									
Exploration	0	0	0	2	1	0	1	0	0
Novelty	1	0	1	0	0	0	0	0	0
Trial and Error	0	0	3	1	1	2	0	0	1
Personalization	0	0	0	0	0	0	0	0	1
Totals	1	0	4	3	2	2	1	0	2
Phase 6: Identification Phase									
Promotion to Others	0	0	0	1	3	1	0	1	0
Confirmation	0	0	0	1	3	2	3	4	4
Emotional Attachment	0	0	2	0	0	0	0	0	0
Identification	0	0	0	0	1	3	1	0	2

Table A6. Cont.

Experience	HT	BR	M1	M2	M3	M4	M5	M6	M7
Maintenance	0	1	0	2	1	0	0	0	0
Personality Attribution	0	0	1	2	0	1	1	1	0
Recognize Benefits	0	1	2	2	1	0	1	2	0
Recognize Disadvantages	0	1	1	0	2	2	1	0	3
Totals	0	3	6	8	11	9	7	8	9
Phase Ø: Non-Use Phase									
Lack of Use	0	0	0	0	0	0	0	0	0
Non-Acceptance	0	0	0	0	0	0	0	0	0
Suspension of Use	0	0	0	0	0	0	0	0	0
Totals	0	0	0	0	0	0	0	0	0

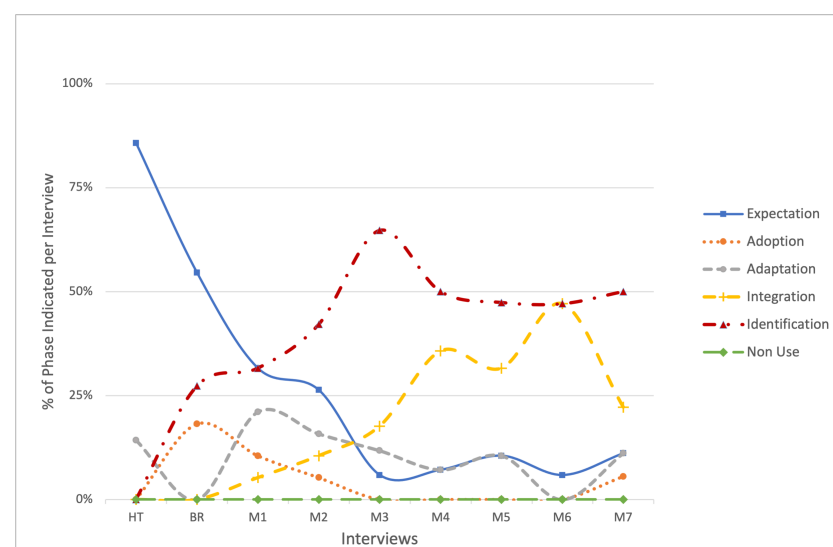


Figure A1. Sasha codes from the table above indicating spikes of phases throughout the study.

Table A7. Participant 2 Coding—Kelly. Month 2 interview is excluded due to a missing record of the interview. HT—House Tour; BR—Bringing Robot; M—Month.

Experience	HT	BR	M1	M3	M4	M5	M6	M7
Phase 1: Expectation Phase								
Anticipation	2	1	0	0	0	0	0	0
Association	2	1	0	0	0	0	1	0
Attitude Formation	1	1	2	0	1	0	0	0
Discuss with Others	0	0	2	3	1	1	0	2
Information Seeking	0	0	0	0	0	0	0	0
Preparation	2	0	0	0	0	0	0	0
Totals	7	3	4	3	2	1	1	2
Phase 2: Encounter Phase								
Phase 3: Adoption Phase								
Adjustment	0	0	2	1	0	0	0	0
Curiosity	0	0	0	0	0	0	0	0
Excitement	1	3	0	0	0	0	0	0
Totals	1	3	2	1	0	0	0	0

Table A7. Cont.

Experience	HT	BR	M1	M3	M4	M5	M6	M7
Phase 4: Adaptation Phase								
Exploration	0	0	3	1	0	1	2	0
Novelty	0	0	1	0	0	0	0	0
Trial and Error	0	0	0	1	0	0	0	1
Personalization	0	0	0	0	0	0	0	0
Totals	0	0	4	2	0	1	2	1
Phase 5: Integration Phase								
Incorporation	0	0	0	0	2	0	1	0
Reinvention	0	0	1	4	0	2	1	1
Use Routines	0	0	0	1	1	3	5	4
Familiarization	0	0	4	1	0	0	0	0
Totals	0	0	5	6	3	5	7	5
Phase 6: Identification Phase								
Promotion to Others	0	0	0	0	0	0	0	0
Confirmation	0	0	0	3	1	3	3	2
Emotional Attachment	0	0	0	0	0	0	0	0
Identification	0	0	0	0	2	0	0	0
Maintenance	0	0	2	0	0	1	0	0
Personality Attribution	0	0	0	0	0	0	0	1
Recognize Benefits	0	2	2	0	3	2	2	2
Recognize Disadvantages	0	2	2	4	1	0	5	4
Totals	0	4	6	7	7	6	10	9
Phase Ø: Non-Use Phase								
Lack of Use	0	0	0	1	0	0	0	0
Non-Acceptance	0	0	0	0	0	0	0	0
Suspension of Use	0	0	0	0	0	0	0	0
Totals	0	0	0	1	0	0	0	0

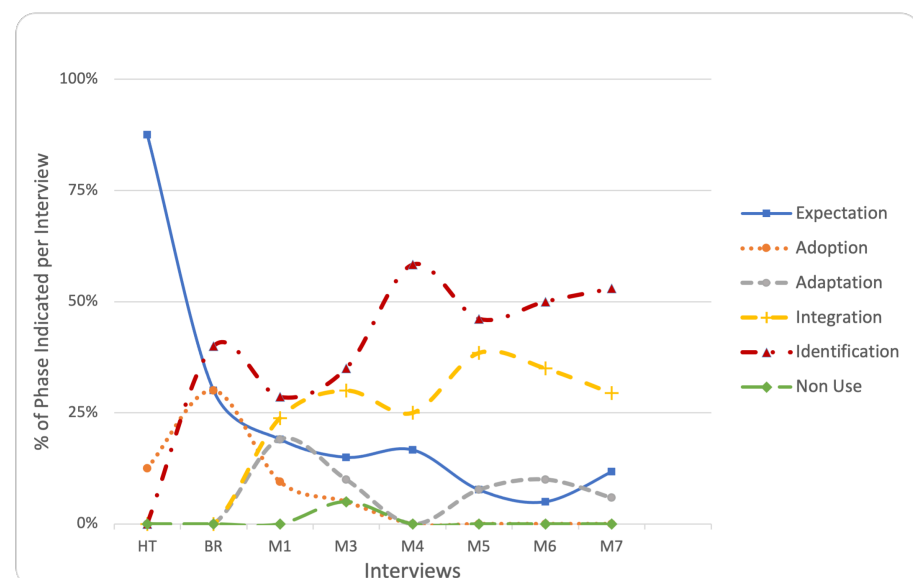


Figure A2. Kelly codes from the table above indicating spikes of phases throughout the study. Month 2 is excluded due to a missing record of the interview.

Table A8. Participant 5 Coding—David. HT—House Tour; BR—Bringing Robot; M—Month.

Experience	HT	BR	M1	M2	M3	M4	M5	M6	M7
Phase 1: Expectation Phase									
Anticipation	1	2	1	0	0	0	0	0	0
Association	2	2	1	1	0	1	0	1	0
Attitude Formation	0	1	2	1	0	0	0	0	0
Discuss with Others	0	0	0	0	0	0	2	1	3
Information Seeking	0	0	0	0	0	0	0	0	0
Preparation	2	0	0	0	0	0	0	0	0
Totals	5	5	4	2	0	1	2	2	3
Phase 2: Encounter Phase									
Phase 3: Adoption Phase									
Adjustment	0	0	3	0	0	0	0	0	0
Curiosity	2	0	0	0	0	0	0	0	0
Excitement	0	0	0	0	0	0	0	0	0
Totals	2	0	3	0	0	0	0	0	0
Phase 4: Adaptation Phase									
Exploration	0	0	1	0	0	1	0	1	0
Novelty	0	1	0	0	0	0	0	0	0
Trial and Error	0	0	0	2	0	0	0	0	0
Personalization	0	0	0	0	1	0	0	0	0
Totals	0	1	1	2	1	1	0	1	0
Phase 5: Integration Phase									
Incorporation	0	0	0	0	0	1	3	5	2
Reinvention	0	0	2	1	1	2	0	1	3
Use Routines	0	0	0	1	1	0	2	0	0
Familiarization	0	3	0	1	0	0	0	0	1
Totals	0	3	2	3	2	3	5	6	6
Phase 6: Identification Phase									
Promotion to Others	0	0	0	1	1	2	0	0	0
Confirmation	0	0	0	0	2	1	1	2	3
Emotional Attachment	0	0	0	0	0	0	0	0	0
Identification	0	0	1	0	0	0	0	0	0
Maintenance	0	0	1	0	0	0	0	0	0
Personality Attribution	0	0	0	0	0	0	1	1	1
Recognize Benefits	0	1	1	0	2	5	1	2	0
Recognize Disadvantages	0	1	1	2	4	2	4	9	6
Totals	0	2	4	3	10	10	7	14	10
Phase ∅: Non-Use Phase									
Lack of Use	0	0	1	0	0	0	0	0	0
Non-Acceptance	0	0	0	0	0	0	0	0	0
Suspension of Use	0	0	0	0	0	0	0	0	0
Totals	0	0	1	0	0	0	0	0	0

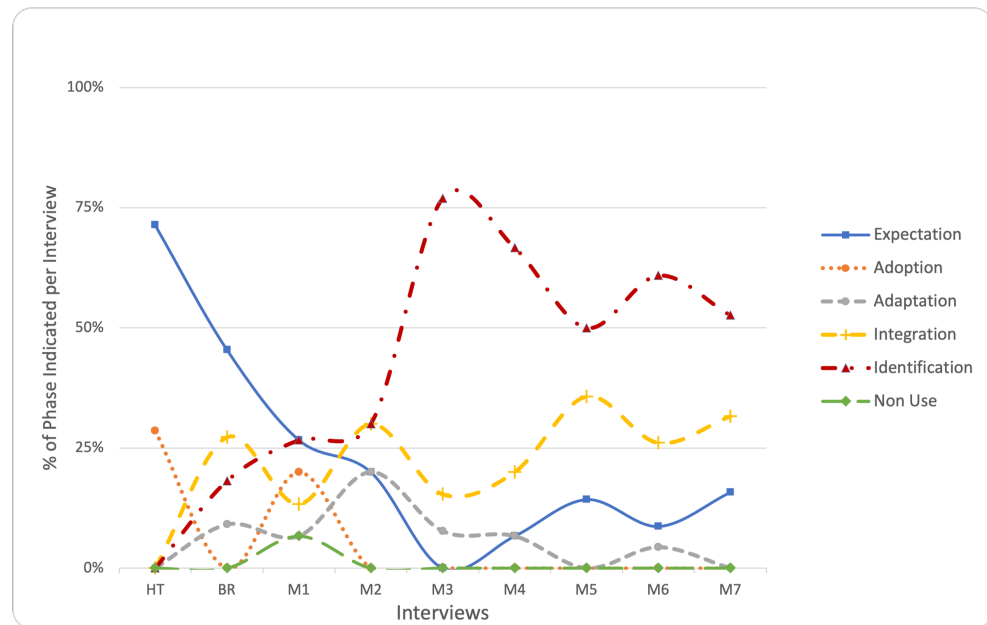


Figure A3. David codes from the table above indicating spikes of phases throughout the study.

Table A9. Participant 7 Coding—Jessica. HT—House Tour; BR—Bringing Robot; M—Month.

Experience	HT	BR	M1	M2	M3	M4	M5	M6	M7
Phase 1: Expectation Phase									
Anticipation	1	1	0	0	0	0	0	0	0
Association	2	1	0	0	0	0	0	0	0
Attitude Formation	1	5	2	2	0	0	2	0	0
Discuss with Others	0	0	1	2	0	2	1	0	0
Information Seeking	0	0	0	0	0	0	0	0	0
Preparation	2	0	0	0	0	0	0	0	0
Totals	6	7	3	4	0	2	3	0	0
Phase 2: Encounter Phase									
Phase 3: Adoption Phase									
Adjustment	0	0	0	1	0	0	0	0	0
Curiosity	1	0	0	0	0	0	0	0	0
Excitement	0	0	0	1	0	0	1	0	0
Totals	1	0	0	2	0	0	1	0	0
Phase 4: Adaptation Phase									
Exploration	0	0	0	0	0	0	0	0	0
Novelty	0	0	0	0	0	0	0	0	0
Trial and Error	0	0	1	1	0	0	0	0	0
Personalization	0	0	0	0	0	0	0	0	0
Totals	0	0	1	1	0	0	0	0	0
Phase 5: Integration Phase									
Incorporation	0	0	0	0	0	0	0	0	0
Reinvention	0	0	0	0	0	0	0	0	1
Use Routines	0	0	0	0	0	0	1	3	0
Familiarization	0	0	0	0	0	0	0	0	0
Totals	0	0	0	0	0	0	1	3	1

Table A9. Cont.

Experience	HT	BR	M1	M2	M3	M4	M5	M6	M7
Phase 6: Identification Phase									
Promotion to Others	0	0	0	0	0	0	0	0	0
Confirmation	0	0	0	0	1	0	4	2	2
Emotional Attachment	0	0	0	0	0	0	0	0	0
Identification	0	0	0	0	0	0	0	0	0
Maintenance	0	0	0	1	0	0	0	0	1
Personality Attribution	0	0	0	0	0	0	1	0	1
Recognize Benefits	0	0	1	1	0	0	1	2	0
Recognize Disadvantages	0	2	3	3	0	0	5	2	0
Totals	0	2	4	5	1	0	11	6	4
Phase Ø: Non-Use Phase									
Lack of Use	0	0	1	4	5	0	0	0	0
Non-Acceptance	0	0	0	1	0	4	4	12	6
Suspension of Use	0	0	0	0	0	0	0	0	0
Totals	0	0	1	5	5	4	4	12	6

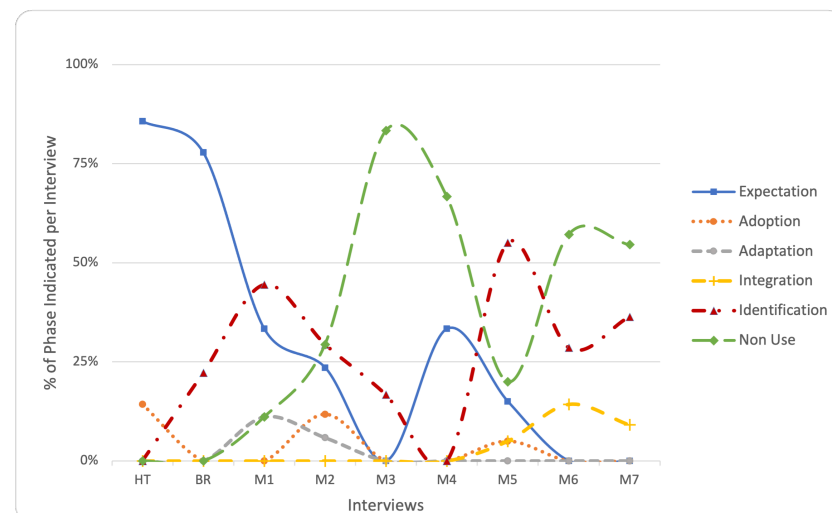


Figure A4. Jessica codes from the table above indicating spikes of phases throughout the study.

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